AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XLI. NEW YORK—THURSDAY, DECEMBER 4, 1919—CHICAGO No. 23

# New York-London Airship Line Service is Planned

## Flying schedule, necessary capital, rate of fare, mail and freight charges and cost and location of necessary terminals are outlined in the report issued by Vickers, Ltd. Two sailings weekly across the Atlantic with service extensions from San Francisco to Melbourne are proposed

By Allen Sinsheimer

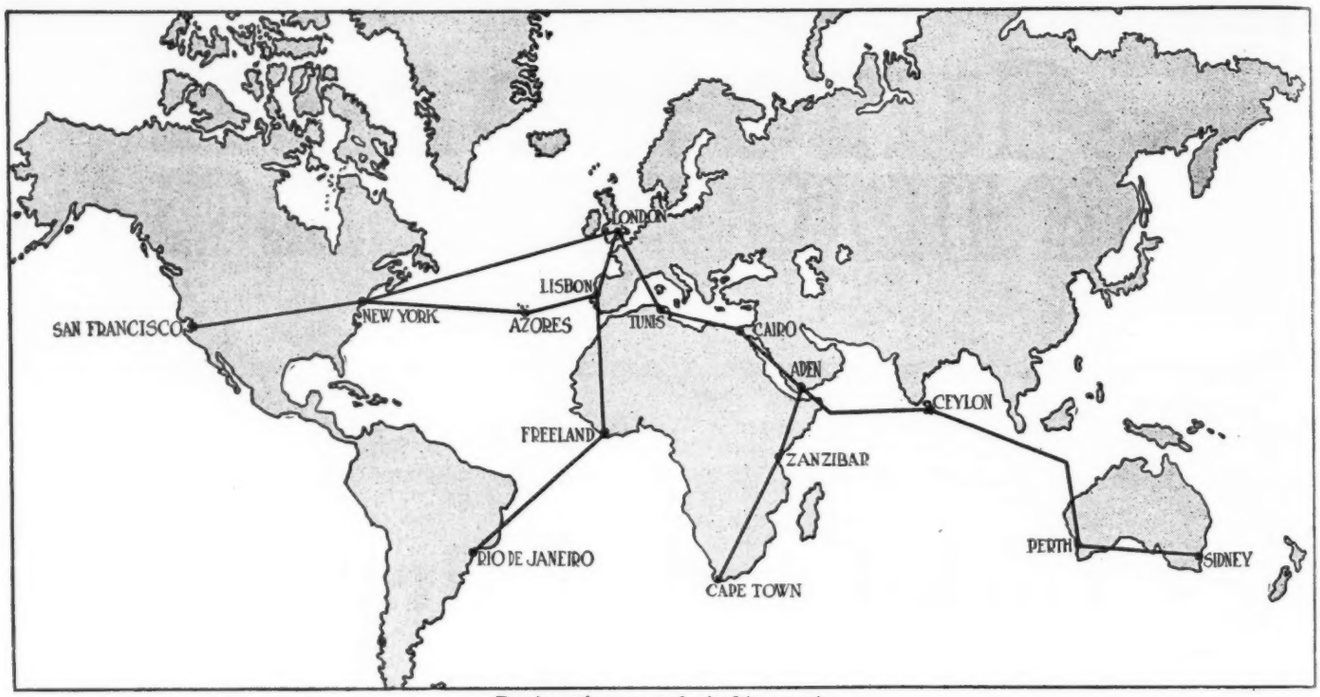
AN AIRSHIP service, first between New York and London and later extended throughout the world, with the New York-London route served by four airships each of 3,500,000 cu. ft. capacity, capable of carrying 15 tons of passengers and mail at $240 per passenger and 3 cents per ounce for mail, and making the round-trip journey in less than a week, is contemplated by Wickers, Ltd., of England, according to a report just issued by that concern.

Following a thorough investigation, the company finds that airships will be more economical and practical for long distance passenger travel as compared with airplanes. Planes, it is said, are not capable of more than 2,000 mile non-stop flights, whereas airships will be practical for 10,000 mile journeys. It will be practical, asserts the report, to construct airships to carry 50 tons of passengers and freight for non-stop voyages over 10,000 miles at a speed of 80 m.p.h.

Considering first the construction of airships for the London-New York route, the company estimates that a capital of $13,000,000 will be necessary, based on the figures given above, for passenger and mail rates. An airplane service between the two cities, says the report, will require intermediate stops at New Foundland and in Ireland for replenishment of fuel, etc., and it is estimated would require a capital of $19,300,000, with transportation rates of $575 each for passengers and 7½ cents per ounce for mail.

The airplane time with stops in Ireland and New Foundland would be two days as against two and a half days for the airship making its journey from London to New York by the southerly route and two days from New York to London by way of the northerly route. Consequently, states the report, airship transportation cost will be one-half that of airplane transportation and if the airship stops at intermediate points a greater number of passengers could be carried, further decreasing the cost.

With the development of such transport, Vickers believes that no important city will be further from London than ten days and estimates New York at two and one-half




*Routes of proposed airship service*

days; San Francisco, four and one-half days; Cairo, one and one-half days; Perth, seven days; Cape Town, five and one-half days, and Rio De Janeiro, four days.

As the maximum distance of direct flight required to any of these centers is not more than 3,500 miles, the size of the airship already described would be suitable. To emphasize the importance and safety of the journeys, the report states that the commercial use of airships was demonstrated in Germany before the war, when the Hamburg-American Steamship Co. ran passenger airships for pleasure purposes at a profit and carried 17,000 passengers without accident or mishap.

**AIRDROMES**

Airdromes would be required only at the terminal stations and landing places and mooring-out towers need only be provided 3,500 miles or more apart. The problem of landing and housing an airship in stormy weather has been solved by the use of the mooring tower to which the airship is moored by the nose and is able to ride out in any weather clear of the ground. Arrangements are provided whereby the ship can be moored easily to or released from the tower in winds up to 60 m.p.h. without difficulty and passengers can get in or out of the ship by means of the lift in the tower. Consequently, ships would not need to put into the sheds except for periodic overhaul.

Vickers believes that the demand for airship travel will be chiefly for passenger traffic, for the carrying of freight of high intrinsic value, preliminary exploration of large virgin tracts of country, for pleasure trips and for private owners, who will want small non-rigid airships that can be run at about the same cost as a small yacht. To meet these requirements it will be necessary to provide four ships:

1. An airship of moderate size and high speed for express, mails and passengers.
2. A passenger liner for passenger traffic of large size and high speed.
3. A large airship, comparatively slow speed and large carrying capacity, for general transport.
4. Small airships for private use.

The proposed London to New York service is expected to be operated by an airship of 3,500,000 cu. ft. gross gas capacity, with total lifting power of 105 tons and a disposable lift available for fuel, oil, stores, crew, passengers and mail of 68 tons, a total engine power of 3,500 b.hp., with a speed at full power of 75 m.p.h., a normal flying speed with 2,000 b.hp. of 60 m.p.h., and gasoline consumption of .5 lb. per b.hp. hr., and an oil consumption of .03 lb. per b.hp.

As the prevailing winds on the direct route from London to New York are usually west to east, they will favor the eastbound journey and be unfavorable to the westbound, and it is planned consequently to make the westbound journey over the southerly direction via the Azores where the winds are more favorable.

**PROPOSE FOUR SHIPS**

It is proposed to fly four airships on the service, two in service at a time. The average time table is planned so that each airship will make two crossings or one double journey per week, thus giving a service with two airships of two sailings each way per week, with an average time table proposed as follows:

| Leave London | Arrive New York |
|---|---|
| Monday a. m. | Wednesday p. m. |
| Thursday a. m. | Saturday p. m. |
| Leave New York | Arrive London |
| Monday p. m. | Thursday a. m. |
| Thursday p. m. | Sunday a. m. |

From available weather records it is considered the crossings will be practicable at least 300 days in the year or 82 per cent of the total days, so that a total of 200 crosings can be maintained in a year regularly until weather conditions have been further studied, from May to September, and more or less irregular from October to April.

Two watches of crews will be carried working in eight-hour shifts, with both watches on duty when leaving or landing. Eight men, including the navigating officer, steersman, elevator man, four engineers and a signal man, will make up each watch, and in addition there will be two stewards and a commanding

officer, making a total of nineteen men, who will probably weigh, including personal effects of 20 lbs. and fuel at 10 lbs. per man, 160 lbs. per man, a total of 3,600 lbs.

**THE LOAD CAPACITY**

Estimating the passengers at 170 lbs. each, with personal effects of 50 lbs. and fuel at 15 lbs. each, it is stated that they will weigh an average of 235 lbs. Thus the distribution of the disposable weight for the journey will be:

Crew and effects, 1.5 tons.
Fuel and oil for 80 hr. at 60 m. p. h., 38 tons.
Start ballast for 2,000 ft., 6.5 tons.
Emergency ballast, 5.0 tons.
Available for passengers and mail, 15 tons.
Total, 68 tons.

The fifteen tons allowed for passengers and mail will carry 140 passengers with their effects, or 10 tons of mail and fifty passengers.

The cost of running the ship, including interest on capital required, allowances for depreciation, insurance, operation, repair and maintenance, the company estimates will be:

| | |
|---|---|
| 4 airships to cost, $2,000,000 each | $ 8,000,000 |
| 2 double airship sheds, $1,500,000 each | 3,000,000 |
| Land for two sheds and airdromes, $150,000 each | 300,000 |
| Workshops and equipment | 750,000 |
| Working capital, including spare parts and stores | 850 000 |
| Wireless equipment | 50 000 |
| Miscellaneous accessories | 50,000 |
| Total | $13,000.000 |

Annual charge of interest at 10 per cent on this $1,300.000.

Depreciation includes estimates of the useful life of airships at three years with an obsolete value of $100,000 per ship, making a total depreciation of $1,700,000 per ship in three years. The useful life of an airship shed is placed at 30 years, with an obsolete value of 10 per cent and workshops and plants at 5 per cent depreciation per year, making a total annual for depreciation for ships, sheds and workshops of $2,150,000. Insurance premiums are estimated at $617,500. Annual establishment expenses, including salaries of officers and crew, at $130,000, managment and staff at $25,000 with 100 workmen at the sheds and stores at $100,000, makes a total of $255,000. $125,000 is allowed for repairs and maintenance of airships and sheds. Thus the totals of annual charges are:

| | |
|---|---|
| Interest on capital | $1,300.000 |
| Depreciation | 2,650,000 |
| Insurance | 617,500 |
| Establishment expenses | 255.000 |
| Repairs and maintenance | 125.000 |
| Total annual charges | $5,000,000 |

Amount chargeable per trip includes the appropriation of annual charges, the cost of fuel and oil, the cost of hydrogen and the cost of food and is estimated as follows; taking the total number of crossings per year as 200:

| | |
|---|---|
| Appropriation of annual charges per crossing | $25,000 |
| Gasoline per trip, 30 tons at $125 per ton | 3,750 |
| Oil per trip, 2 tons, $200 per ton | 400 |
| Hydrogen, 750,000 cu. ft | 1,875 |
| Food per trip for crew of 19 and 100 passengers | 2,000 |
| Total | $33,025 |

This is at a rate of $240 per passenger and $2,125 per ton of mail. It will be noted that the direct running cost is 25 per cent and the overhead charges 75 per cent of the total cost.

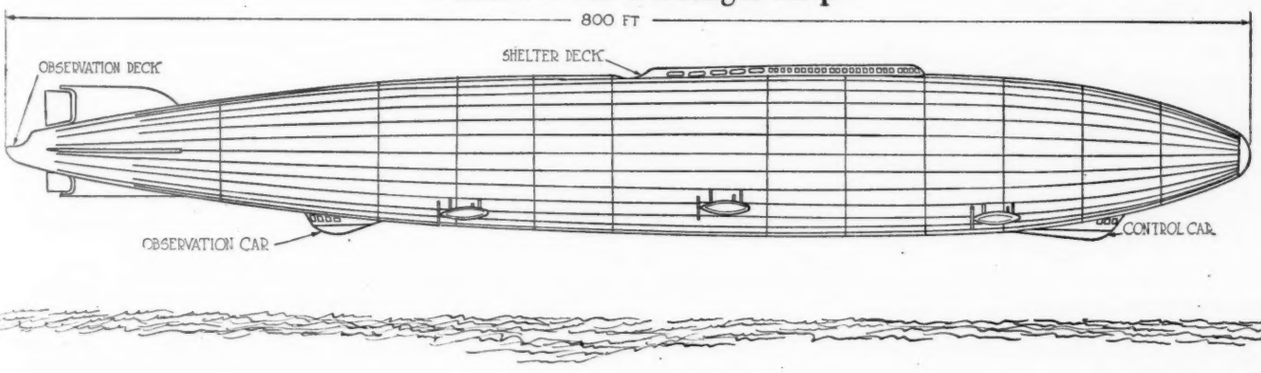
In arranging the financial and working conditions, Vickers plans to ask financial assistance from the Government because the service would be the means of keeping officers and crew in constant training and both ships and the men would be available for naval service. It also plans to provide the necessary technical staff, build the airships and form a joint syndicate with a shipping company, which would undertake the organization of operation of the services and the necessary publicity.

Vickers anticipates that the government would loan airship sheds and flying crews free until the experimental stage is passed, the company providing the necessary capital for sheds and landing grounds. It believes the government should loan naval airship crews and handling parties until men can be trained by the company and it is a paying concern; also that the government should pay a substantial subsidy for carrying of mail and share or undertake all the financial risk of insurance until the security of the service is established so as to warrant underwriters giving reasonable rates.

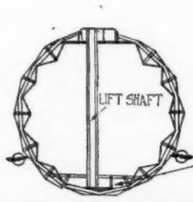
The general specifications of the proposed ship include:

| | |
|---|---|
| Gross Gas Capacity | 3,500.000 cu. ft. |
| Overall Length | 800 ft. |
| Maximum Diameter and Overall Width | 100 ft. |
| Overall Height | 105 ft. |
| Total Lift (68 lbs. per 100 cu. ft.) | 105 tons |
| Disposable Lift | 68 tons |

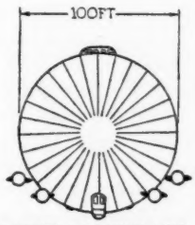
## Plans for the Passenger Ship



END VIEW LOOKING FORWARD

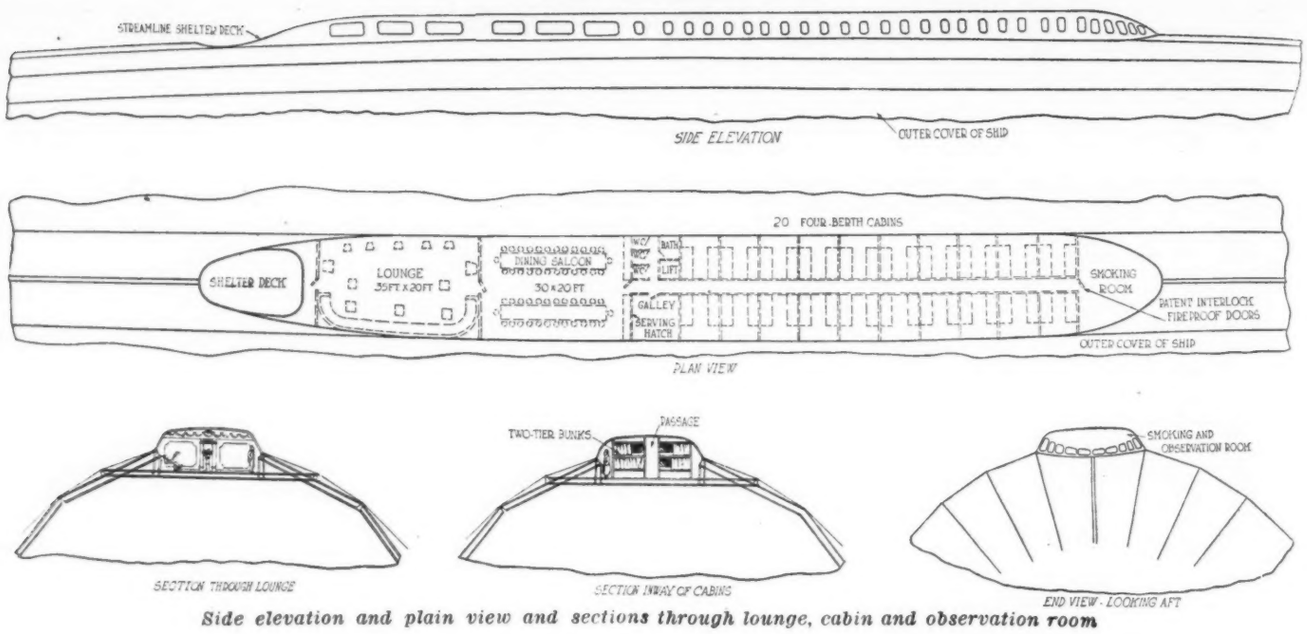



SECTION SHOWING LIFT TO PASSENGERS QUARTERS




END VIEW LOOKING AFT

***The 3,500,000 cu. ft. passenger and mail carrying airship***




*Side elevation and plain view and sections through lounge, cabin and observation room*

| | |
|---|---|
| Total Maximum Power of Engines..... | 3,500 b. hp. |
| Cruising Power..... | 2,000 b. hp. |
| Speed at Full Power..... | 75 m. p. h. |
| Endurance at Cruising Power (Speed at Cruising Power)..... | 60 m. p. h. |
| When carrying 15 tons of passengers and freight 80 hrs..... | 4,800 miles |
| When carrying 10 tons of passengers and freight 90 hrs..... | 5,400 miles |

(Note: The "Disposable Lift" is the lift available for fuel and oil, stores, crew and passengers, mails and freight, etc.)

The particulars and performance stated are based on present design, and the actual performance of ships of 2,000,000 cu. ft. capacity now in service. It is considered that the figures given are conservative, and that actually the increased size of ship would enable greater structural efficiency and consequently greater disposable lift to be available than that specified.

The special features include, for passenger accommodation, a living salon which will be along the top of the airship in the style of a Pullman car, part of which will be fireproof for the smoking room. An open shelter deck will also be provided. The salons will be constructed with windows and a passenger lift will provide communication between the passenger quarters and the lower part of the ship.

Passengers may also use the observation car fitted out below the hull, and will have sleeping quarters in the forms of berths in small cabins on top of the airship forward of the living salons. An electrically equipped mess kitchen will provide meals served in the salon and electrical radiators will provide heat.

## STREAM LINE HULL

The use of hydrogen as fuel with the engines in part operating on gas fuel, will be arranged so that the gas can be consumed at such a rate that the loss of lift equals the loss of weight of fuel consumed by the other engines, to overcome the greatest problem which is the maintenance of an airship at a constant height. Apparatus may be provided to condense the water of combustion and recover it to avoid variation in lift, due to gasoline consumption, and apparatus may be included to enable water ballast to be picked up periodically from the sea.

The hull will be shaped in stream line form. The internal keel quarter running along the bottom will provide the space for gasoline and oil tanks and water ballast. The outer covering will be made of special water-proofed fabric and the gas bags of rubber-proofed cotton fabric lined with gold beater skin, the decks to be fitted with automatic relifting valves and hand control maneuvering valves. The control and navigating compartment will be built on the hull toward the forward end of the ship and contain all main controls and navigating instruments and the wireless telegraphy cabin. Six machinery cars are contemplated, each containing one engine installation with a direct driven propeller fitted at the aft end, two cars to be suspended on each side of the hull with ample ground clearance for propellers, two cars to be situated underneath the hull with landing gear and floats.

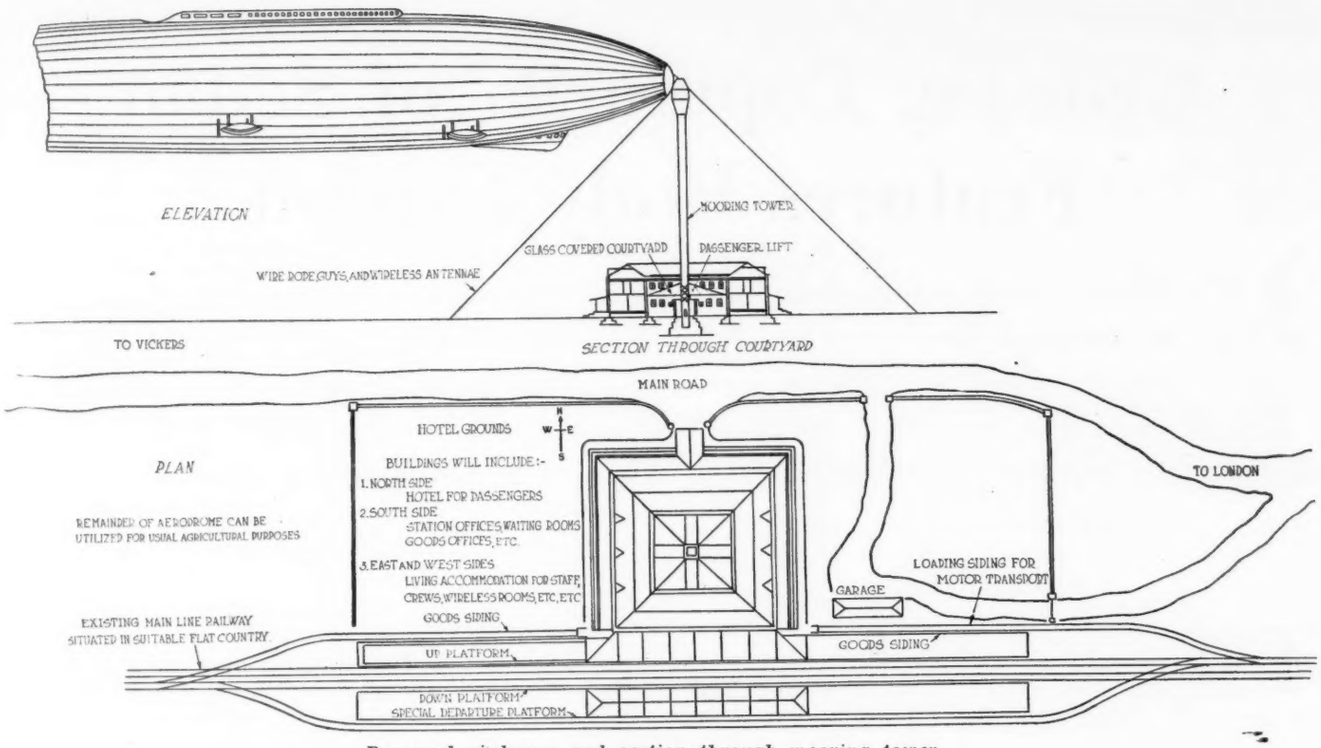
Six engines of nominal 600 b. hp., designed to develop maximum power at 5,000 ft., equipped with Maybach charged pump systems, and with radiators to be fitted in slides to enable them to be completely drawn into the cars when the engines are not running, form the machinery arrangement. The transmission gear in two of the wing cars only will be fitted with reversing gear to enable the ship to be driven astern and special exhaust silencers to reduce exhaust noise, are planned. All of the engines will be designed to run on gasoline, but having arrangements to enable them to run alternately on hydrogen gas.

Starting controls, gas valve controls, ballast discharge controls, engine room telegraph and telephone communications will be operated from the forward control compartment. Inflated buffer landing bags will enable the airships to land either on land or sea. Electric power will be provided by dynamos driven off the main engines. At the terminal point of each ship route it would be necessary to have:

Hydrogen generating plant and storage.
Repair workshops and stores.
Meteorological office and wireless.
Electric light signaling and landing arrangements.
Offices, etc.

It is planned to have the airdromes in direct communication with the port served, if possible, near chemical works where hydrogen could be obtained as a by-product, laid out on flat ground and remote from hills. The double sheds would require two berths each 850 ft. long, 150 ft. wide and 115 ft. high, with opening doors, provided with hydrogen filling mains and with gear for slinging airships from the roof when deflated for overhaul.

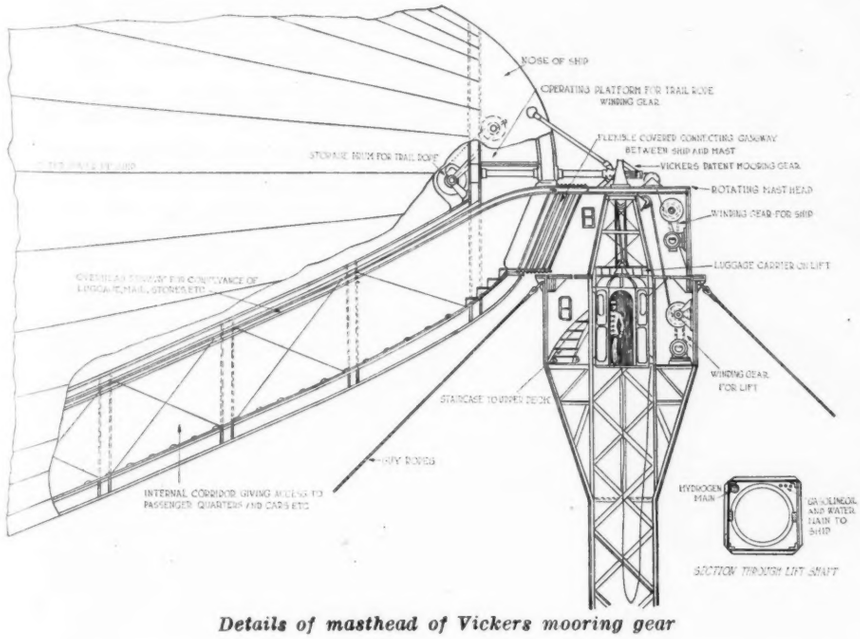
The mooring-out station provided at each airdrome would consist of a mooring tower, 150 ft. high with revolving head, a mechanically handled gear, consisting of controllers run on




*Proposed airdrome and section through mooring tower*

guide rails from tower to the ship would enable the ship to be safely moved to the shed.

The only important weather factor that must be taken into consideration, states the report, is wind, as rain, hail, snow and fog have little influence on an airship flying with suitable rainproof, non-absorbent covering and further because at 8000 ft. the average prospective storm can be entirely avoided. Winds and heavy storms which create them have been thoroughly studied and it has been found that heavy storms of cyclonic nature rarely cover an area of more than 200 miles in diameter and progress at considerably less speed than the air movement in an area and consequently an airship can clear a cyclonic area by a deviation from her route of not more than 200 miles.


NOSE OF SHIP
OPERATING PLATFORM FOR TRAIL ROPE WINDING GEAR
FLEXIBLE COVERED CONNECTING GANGWAY BETWEEN SHIP AND MAST
STORAGE DRUM FOR TRAIL ROPE
VICKERS PATENT MOORING GEAR
ROTATING MAST HEAD
WINDING GEAR FOR SHIP
LUGGAGE CARRIER OR LIFT
OVERHEAD TRAVELLER FOR CONVEYANCE OF LUGGAGE, MAIL, STORES ETC.
WINDING GEAR FOR LIFT
STAIRCASE TO LOWER DECK
GUY ROPES
INTERNAL CORRIDOR GIVING ACCESS TO PASSENGER QUARTERS AND CARS ETC.
HYDROGEN MAIN
GASOLINE AND WATER MAIN TO SHIP
SECTION THROUGH LIFT SHAFT

*Details of masthead of Vickers mooring gear*

The prevailing winds north of the equator are divided clearly into two regions, the first between the west coast of Africa at an altitude of 30 deg. north to 15 deg. north and the American coast from Florida to the Amazon, in which region the winds blow from northeast to north at the African coast and become more easterly across the Atlantic and are practically northeast at the Amazon and east at the Mexican gulf. They are steady winds averaging from 10 to 15 m. p. h. and favorable for flights from east to west. The second region between the coast of the United States from Florida to New Foundland and from the north coast of Spain to the north coast of Scotland has prevailing winds blowing due west in the winter, southwest in the summer and changing to southwest on the European coast in winter and almost due west in summer. These winds are variable but persistently western. Their speed is variable, ranging from 15 to 40 m. p. h. and heavy gales are frequent. Records kept indicate that the general winds of 40 m. p. h. or more do not occur more than 20 days per year, or for more than 300 hrs. per year in total time of duration and are practically all north of the latitude between Bordeaux and Nova Scotia. Sixty per cent of the heavy storms occur in the winter and less than 10 per cent in the summer. Constant winds of 30 to 40 m. p. h. are common at high altitudes and may be used to shorten the duration of journeys considerably, although it is undesirable to fly at great heights owing to the low temperature. Suitable provision for heating, however, may make flights comfortable at 10,000 ft.

Navigation of airships is slightly more difficult than that of steamships because of the greater drift, states the report, but may be reliably undertaken

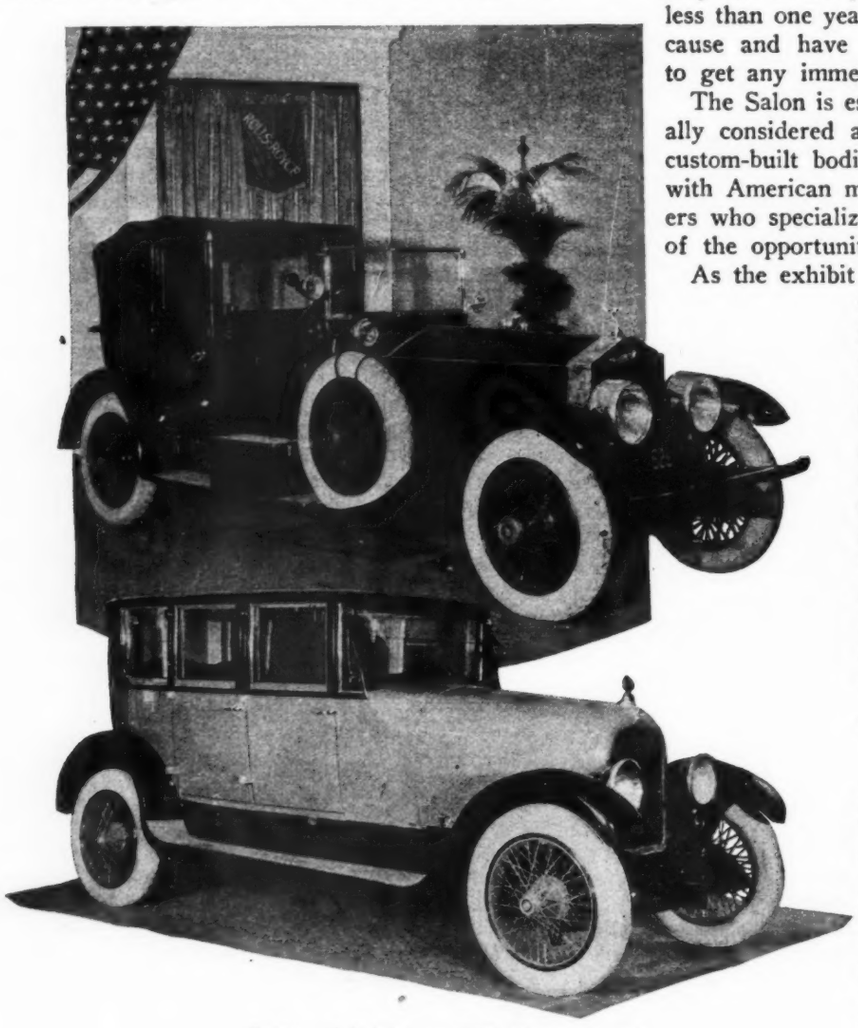
(*Continued on Page* 1115)

# Growing Popularit[illegible]dan Features Body E[illegible]t

**There is much to commend in the design, decorations and trimmings of bodies shown this season, according to Mr. Mercer, who is one of the old school carriage men who has kept pace with the development in motor car work. His comment on the Hotel Commodore exhibition, together with his article printed last week on the "Trend of Body Design" are especially instructive**

By George J. Mercer

THE annual exhibit of foreign and high priced domestic cars, at the Hotel Commodore, compared well with its predecessors, when the conditions under which it was held are considered. At one time it was announced that it would be cancelled. The labor conditions have certainly been unfortunate, and it is to the credit of many of the exhibitors that, although they are in no position to accept orders for bodies for less than one year's delivery, they have been loyal to the cause and have spent money that they cannot expect to get any immediate returns from.



*Barker Cabriolet on Rolls-Royce chassis. Rubay sedan.*

The Salon is essentially a show of merit, and is generally considered as a show of imported chassis and of custom-built bodies. Foreign cars are usually equipped with American made bodies; and, therefore, body builders who specialize in this class of trade take advantage of the opportunity and exhibit independently.

As the exhibit of a body is always much more effective when mounted on a chassis, American cars with special bodies have come to be as numerous as the foreign cars. Then, too, the number of exhibittors being only about a score and the total number of vehicles exhibited less than one hundred, the individual exhibit is more likely to be noticed and talked about. In, fact, every car is sure to be investigated by all who come to the show; the crowd is seldom so great as to impede movement and those in attendance have time to give attention to all enquirers.

### TWO CABRIOLETS

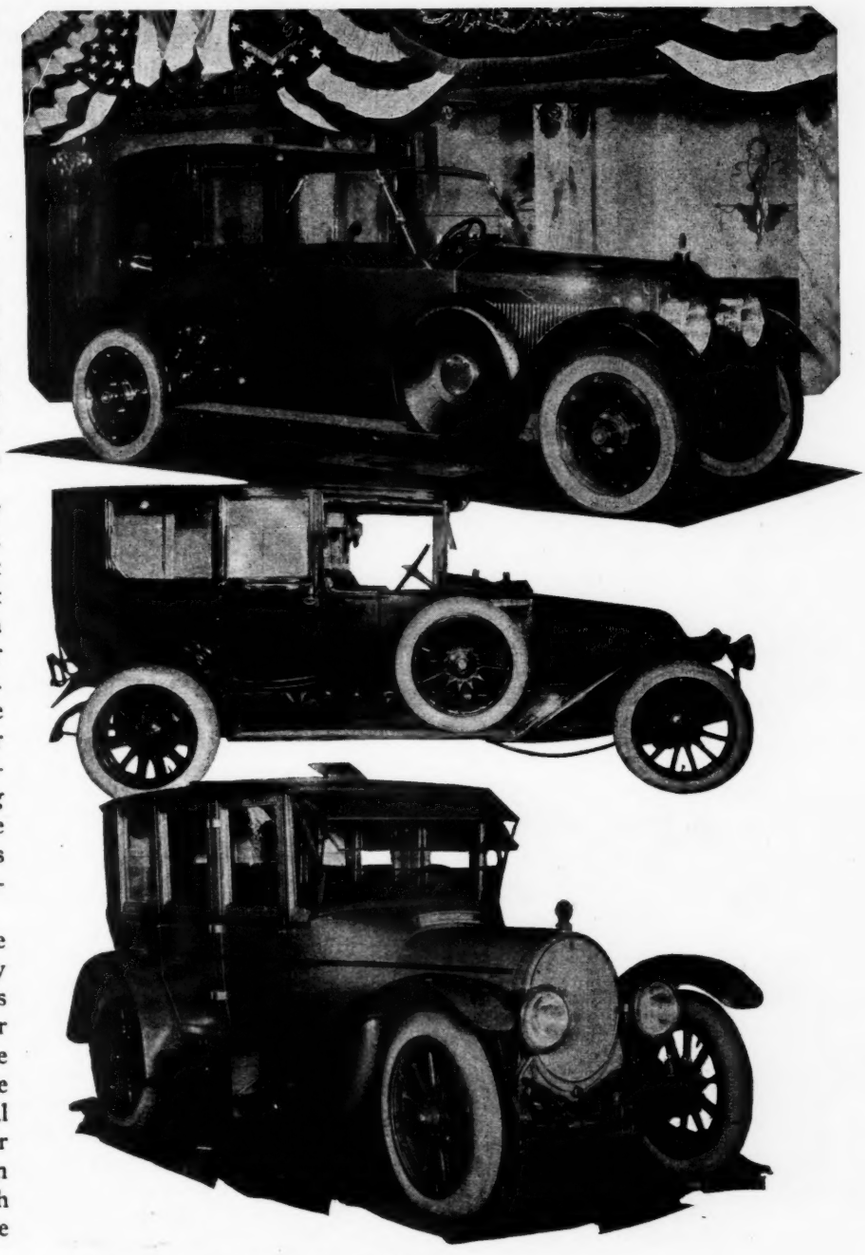
There were six foreign bodies at the Salon, exhibited by Rolls Royce, Renault and Delage. The body on the Rolls-Royce chassis was a Barker cabriolet, similar to their production of former years. As the photograph shows, this is a rather small body; it is trimmed in carriage style and has a well rounded back bow. The cabriolet is not capable of much change; it has been customary to mount it on a chas-

sis having the regulation fenders and runboards, and it looks best this way, as it looks heavier than it really is, on account of having so little glass space. Several of these cabriolets were fitted with six fenders, a manner of mounting that is usually reserved for the brougham.

There were nine cabriolets at the show. The Daniel body had extra seats facing forward, the other had them facing toward the rear. The other cabriolet illustrated is a Fleetwood body on the Packard. The sketch shows the manner of mounting the reading lamps, one at each top corner of the rear bow, and the pillow for a rear seat back.

The shape of the top bow is usually as shown in these two photographs. With a radius of approximately six inches, it locks well when the back corner of the body is round; with a square cornered body the bow is either square or has a very small rounding. Both styles of bodies were shown, the round corner type mainly. One other point worthy of mention on the Fleetwood job is the straight line running through from the radiator. The fore body has a bevel edge and the line is carried across at the height of the driving seat back.

The cabriolet is the most exclusive of the town car bodies, and naturally its trimming material and appointments are high class. Wool fabrics—either broadcloth or a similar weave—were used, and the design was plain, the doors being a flat pattern with natural wood vanity cases, and lights, door trimmings and regulator handles in either dull gold or silver finish. Both a megaphone and a dictagraph were supplied.



*Fleetwood cabriolet on Packard chassis.*

*Renault limousine.*

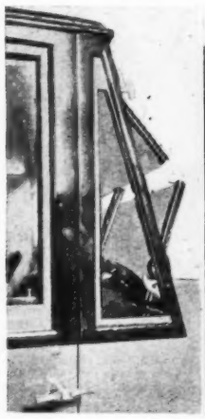
*Brewster sedan with swinging upper windshield glass.*

**ONLY TWO LIMOUSINES**

There were two limousines on exhibition, one by Renault and the other by the Locomobile Co., the latter a stock body. That the limousine is being superseded by the sedan was evidenced by the fact that there were 11 of the latter to two of the former. All the sedans had either the slanting front or an equivalent. The photographs of the Brewster and the Rubay bodies show extensions of the glass beyond the door pillars, but neither is a regulation slanting front. One change in the Brewster from last year's design is that the upper glass now has a swinging instead of a sliding motion. The sliding type is continued; it is more expensive to make, but it is certainly very effective in keeping the rain out, as the lower glass being at another angle than rain out, as the lower glass being at another angle than the upper, the wind will drive the rain away from the opening, and not up to it, as with the ordinary shield arrangement. The Rubay shield is new and possesses the unusual feature that it relies on the suction force of the car's forward motion for ventilating the interior of the body.

In one of the photographs of the Rubay, the slanting shield, is shown with both glasses in the open position, and in this position it does not differ from the ordinary. Where it differs from standard design is that the triangular opening on the side, that always has been closed by a glass, in this case has no glass. There is a glass at the perpendicular pillar, extending about half way up, which can be tilted to any angle desired. It is here shown tipped slightly forward. Above this glass the

*Rubay closed job with cane wood interior finish and individual rear seats.*



*Detail of Rubay sedan showing side ventilator.*

*Leather visor on Daniels sedan.*

space is entirely open. It is calculated that the forward movement of the car will exert a suction, drawing air through the triangular openings at the sides.

Admitting the air at the sides has the effect of decreasing the pressure and allowing the air inside the body to float easily back and be drawn out at the rear openings. It is claimed that the smoke from a cigar at the position of the front seat will pass out this way, rather than be driven backward. The amount of air that is admitted to the car is regulated by the front shield in the ordinary manner. These designs show that builders are intent upon affording good ventilation and yet keep out the rain—an object not easy of accomplishment.

**KEEPING OUT THE RAIN**

In this same connection it was noticeable that many of the touring body shields have a longer overlap of the top glass than usual, some overlapping the lower glass as much as four inches. However, this has been tried out and it does not help much. The trouble is that the rain is driven by the wind pressure up the lower glass and inside the car, and the overlap will not prevent this.

The close-up of the Daniels front shows something new that will surely come into service as time goes on. The leather visor is a development of the practice of placing a curtain or covering of imitation leather over the glass visor to keep the sun from shining directly into the driver's eyes. If a sun shield is needed the first cost could be lessened by using the visor in a fixed position and making it of metal or top material. For real service the visor should be as long as that illustrated, but the appearance can be improved by making it shorter and setting it at a more acute angle.

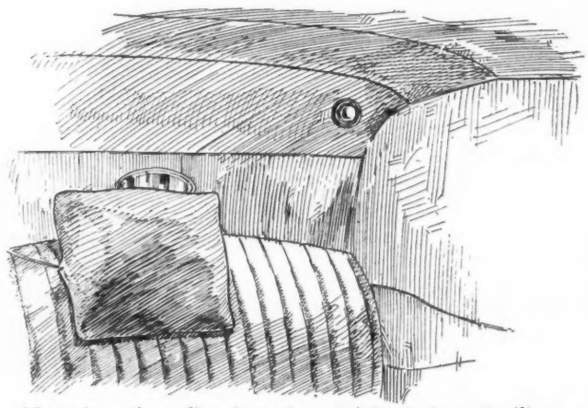
One other advantage of this form of visor is that the forward extension of the roof can be eliminated. While this extension is not particularly conspicuous on straight front bodies, it never looks well on a slant front sedan. Brewster used the cloth visor last year, with the side enclosed.

**SEDAN BECOMING POPULAR**

The sedan is replacing the other large body models and is rapidly becoming an all-the-year car. This was indicated at the show by the trimming arrangements. In warm weather the windows must be opened to the limit, and on all Brewster bodies the fabric extends only up to the line of the seats; above this everything is in skeleton finish and painted, including the roof, a dull color being used.

Daniels also had one body so finished and the photograph of the interior of the Rubay job shows canework in all the panel spaces, while the seat trimming is plain, to allow of easy cleaning. This photo shows the individual seats, the partition forming arm rests The other view of the car shows the luggage carrier covering the rear end of the Marmon chassis.

As regards the interior finish in plain wood, metal or canework above the seat line, it is doubtful whether any considerable number of manufacturers will adopt it. In the first place, it is not cheap; plain work shows defects in workmanship more than fabric-covered work. The framing is not less serviceable when irregular in



*Mounting of reading lamp in cabriolet body and pillow for rear seat back.*

shape or non-uniform in size, and painting or staining the interior of same will more than offset the cost of high priced cloth. Another thing is that an interior so finished looks cold in winter, especially when finished in light color.

### COUPE WITH FOLDING SEAT

There was but one coupe, which was exhibited by Daniels. It was a four passenger model with the front seat divided, the right hand seat folding under the cowl to afford an entrance to the rear seat. An extension covering the frame at the rear serves as a luggage carrier. This body is a fair sample of the large coupe used in increasing numbers throughout the country. In New York the town car serves well, but in the smaller cities the coupe takes its place, making an excellent combined business and pleasure conveyance.

Of the two broughams shown, one was by Brewster and the other by Kellner of Paris. Both have a slight forward extension forming a housing for the roof apron. The latter is supported to roll out to the windshield, and when in use comes under the roof and not on top as formerly. Kellner also had one town limousine on a Renault which was notable for its elaborate interior woodwork in natural finish with the roof paneled and the center portion trimmed in cloth almost white in color. The toilet cases matched the wood finish.

These French bodies were the only ones using an interior wood finish in conjunction with cloth worked in with the design. American body builders never adopted this style; a few years ago they used wood borders below the window openings, but today no wood is used except for the mouldings.

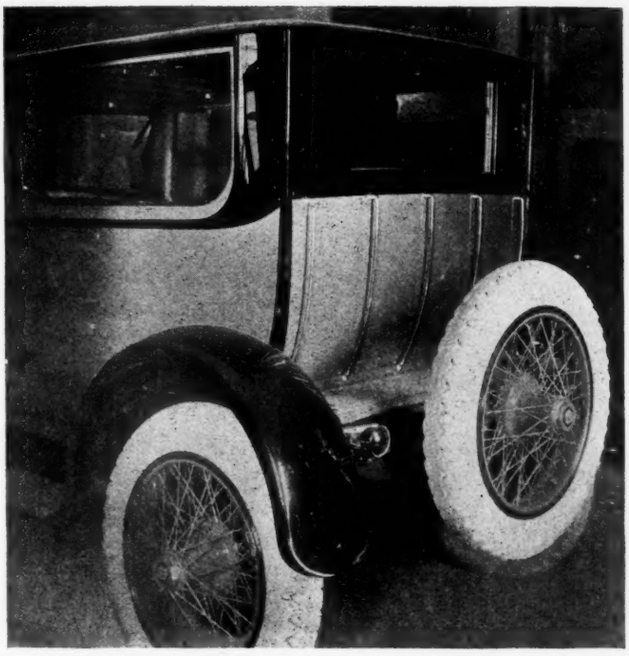
### ILLUMINATE CLOSED SHOW CARS

Right here it may be suggested that the interior of closed bodies should be illuminated at a show. The beautiful blending of colors, the trimming design and the art work on the metal parts should be fairly presented to the public. The public come to see, and they are entitled to a fair chance to see the interior of these luxurious cars.

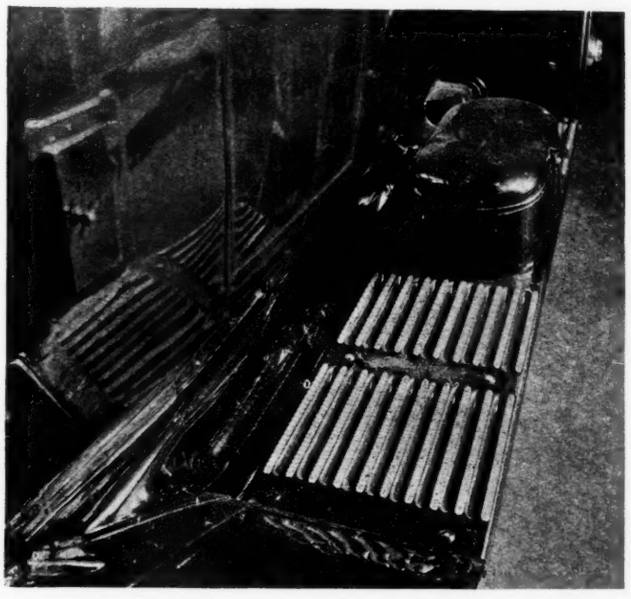
New touring bodies were shown on the Delage, Meteor, Revere, Porter and Dupont.

The first named had a foreign built body; it was made of metal, with wood trim on the top edge, and the opening or door cut at this place covered with a thin brass plate. This was not as obstrusive as might be expected, on account of the wood trim having a natural finish. There was no door on the right side where the extra tire is carried, and the runboard is short. The novel runboard arrangement is shown in the accompanying photograph. This board is metal-covered, the depressions being about ¾ in. deep, with drain holes at the bottom. Scuff plates are screwed on as illustrated. The sketch shows the foot rest in the form of round pillows, covered with carpet and adjusted to the required length by straps.

The windshield is of a form seldom used in this country but very common abroad. Its metal side arms extend about two-thirds the way up, the top corners of the glass are rounded, and there is no protection for the glass across the top. It is a one-piece shield.



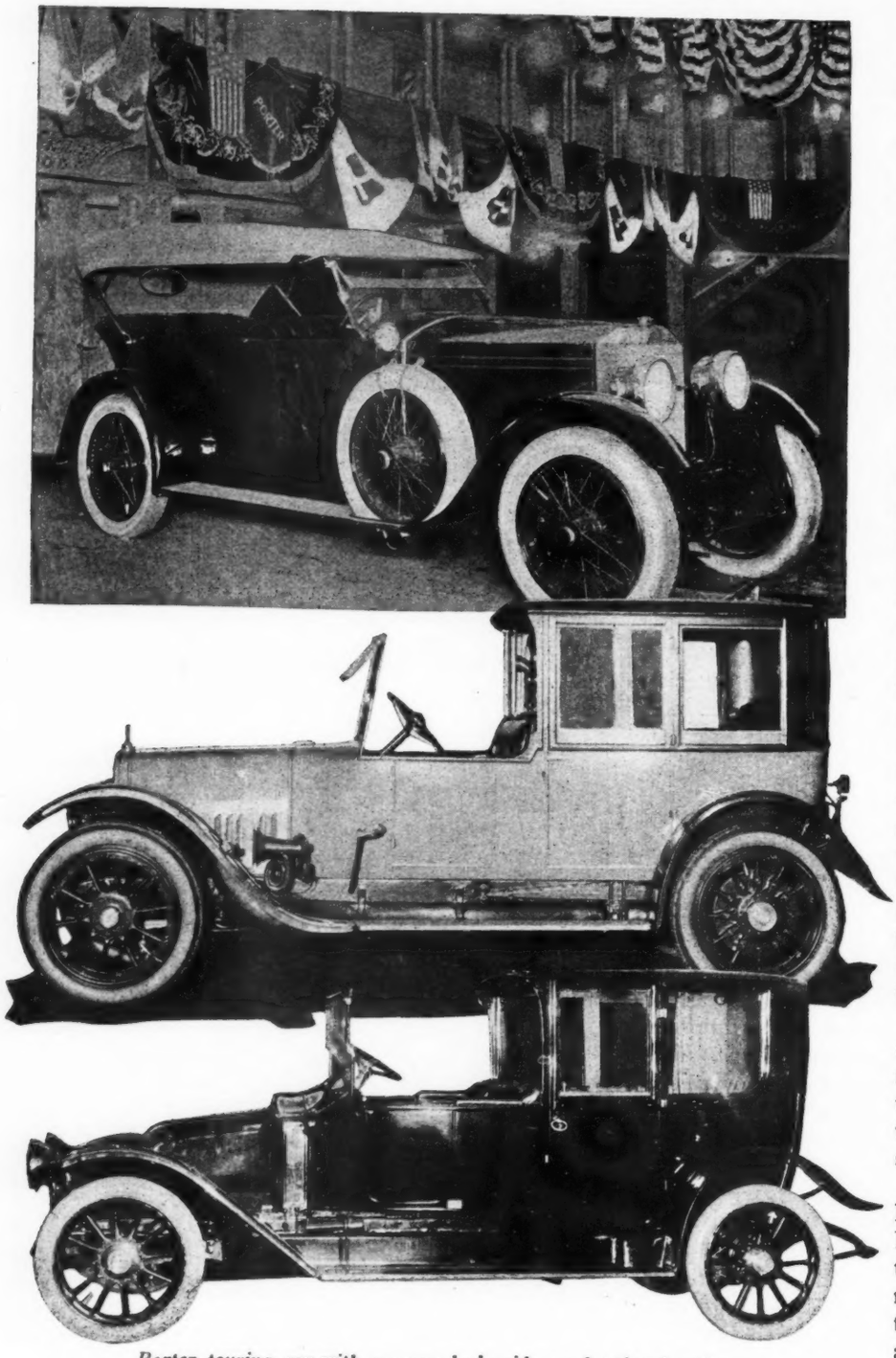
*Luggage carrier on rear of Marmon chassis with Rubay sedan body.*



*Detail of metal covered running board on Delage.*

### POINTED RADIATOR AND WINDSHIELD

The Meteor carried a Fleetwood body and had a pointed radiator and windshield. The engine hood was novel in that the hinge extended in a straight line with the body top line. This hinge is wholly outside the hood and its ends are tapered. This body was one of three with concave side panels. The amount of the sweep can be estimated from the rear door rear line in the photograph. The corners were rounded and the back panel worked into a moderately convex shape. Foot



*Porter touring car with concave body sides and pointed radiator.*
*Brewster brougham with slight forward extension for roof apron.*
*Kellner brougham on Renault chassis*

pillows took the place of a foot rest here also.

The Revere was shown in two touring cars and one runabout. The illustration shows the car sold to King Alphonso, of Spain. It is painted white, with pigskin trimming, victoria top and square foot pillows. The fenders are of the cycle type and steps replace the runboards. The same photo shows the back end of the chassis, and it will be seen that the gasoline tank is made to conform to the shape of the frame and fills space between the side rails.

The sketch shows the door, and brings out how the outer panel and inner framework are tapered toward the top to develop a thin edge. Several bodies were exhibited that had the top edge thinner than usual, but this example was the most extreme. With very light cars this plan seems to work out well, especially if the colors are light also, but for the larger bodies it does not look so well.

**REAR COWL ON PORTER**

The Porter was another body with concave sides, and it also had a bevel edge and second cowl. The sketch shows the manner in which this cowl was developed on another one of their bodies, and the plain trimming design. One very distinct improvement on their hood was the placing of the hood hinge below the top corner, leaving this the proper moulded shape and the use of a flush type hinge. The use of two lines of striping at this place is open to criticism, as it emphasizes the location of the hinge, which would have been hardly noticeable had there been a single stripe, and that above it. The extra seats were not concealed when folded down, a plan that results in more room for the user.

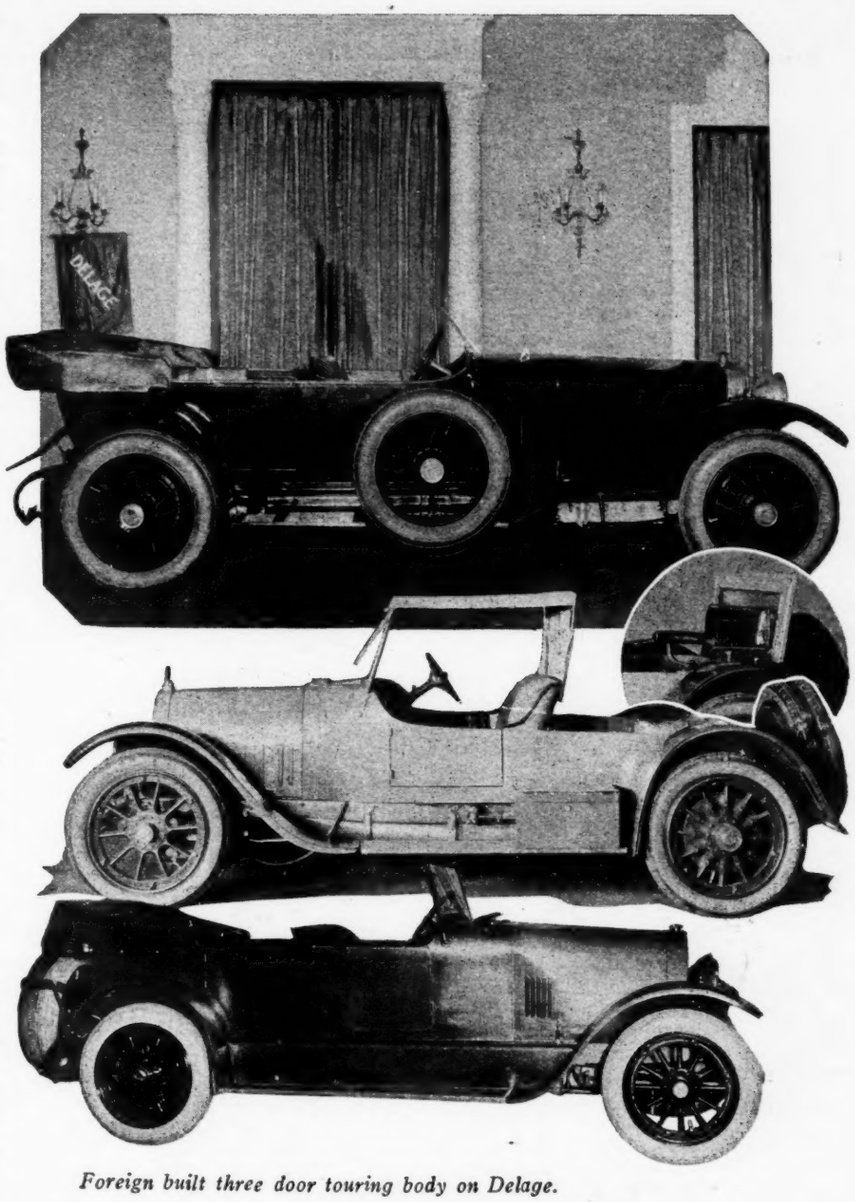
The Dupont, the third concave-sided body at the show, had round rear corners and wood trim on top of the body sides. Its radiator is big-looking and unusual in shape.

The Brooks-Ostruk body on the Rolls-Royce is similar to the Barker bodies used on this car in the past. It is made to give the maximum degree of comfort in the trimming, and the victoria top and tonneau windshield are fittings that go naturally with it. The sketch shows the finish used to edge off the trimming leather on the inside of the body and doors. It is a flat stitched welt set below a small bead; it sets in close and gives a rather uniform trim. On open bodies a thick welt is often used for the edging and where it is nailed down there are noticeable depressions. These are minimized by a thin welt.

**BREWSTER COUNTRY CLUB RUNABOUT**

The three other illustrations are of the Brewster Country Club runabout, the two side views show-

ing the folding seat in its open and closed positions respectively. The space at the rear is used for golf clubs, etc., and can be entirely closed in when desired. The top is revolved on permanent fixtures without detaching and lays close against the back of the front seat when not in use. A cover or apron is buttoned over same, and nothing but the ends of the arms appear. The other view shows the instrument board in two sections. The trimming is waterproof cloth, the painting is a dull coffee color and the upper half of the windshield is split perpendicularly to obviate breakage.




*Foreign built three door touring body on Delage.*

*Brewster Country Club Runabout with rear seat folded.*

*Side view of Dupont touring car.*

**DOORS MOSTLY FLUSH**

The Daniels touring body had a victoria top made of khaki duck, the edges being bound with brown leather to match the car, and the top was unlined.

There were no side lights and the joints were single. This provided for the top to close down very low and the material, unlike leather, would permit of folding without creasing. These tops are considered more of an ornament than a utility, but made as described the maximum use can be obtained from them.

The doors of both closed and open bodies were made flush in most cases. Several used the door tee moulding, and there were two bodies with overlap panels. Both of these used a top finish on the body to prevent the offset of the door beyond the body being noticed. The Ottinger lock was used extensively on open bodies. Inside handles were of the lever type, terminating in a knob that worked in a guide plate. About half of the open bodies had inside handles. The outside handles were of the straight bar design, while rubber covered handles were used generally on closed jobs. Inside and outside hinges were used in about equal proportion, both on the open and closed bodies.

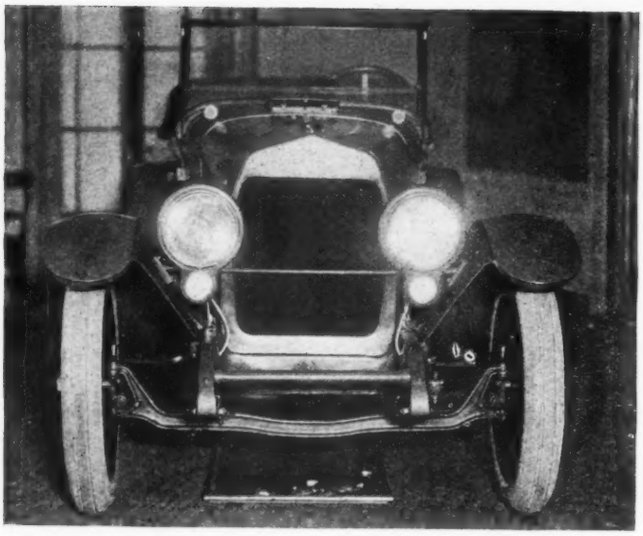
**ATTRACTIVE REAR ENDS**

A glance at the illustrations will show how general has come to be the use of the dome shaped fender. The radius used on the corners varies. The Locomobile used an ogee edge, a fender design made popular by the Rolls Royce car. American builders do not use the front fender length except for sport models. This fender was very slow to come into general use, no doubt on account of its greater manufacturing cost. The Meteor used a fender with a slight peak running along the centre, which looks well. The tendency has been to accentuate this peak on sport models, but it looks best when moderate as here shown.

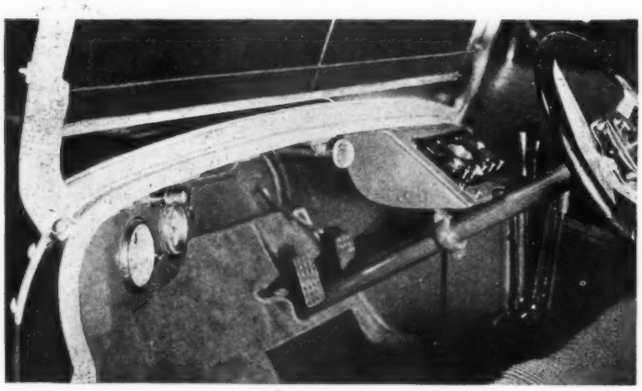
Carrying the extra tires at the front has always been a feature of cars exhibited at this show. The custom is one that foreign cars keep alive in New York. The rear end of the frame has been considered more this year than any previous time. The photos of the Meteor and Revere show two methods of dealing effectively with this problem; others that looked good were the Sunbeam and the Fleetwood, the latter having the gasoline tank surrounded by a cage and the top serving as a luggage rack.

Disk wheels look best when their color is lighter than that of the rest of the car. Those looking best at this show in this respect were painted blue.

Foreign cars do not use the front dust apron and American cars that sell to the same class of customer and are not built in quantity, likewise leave the front

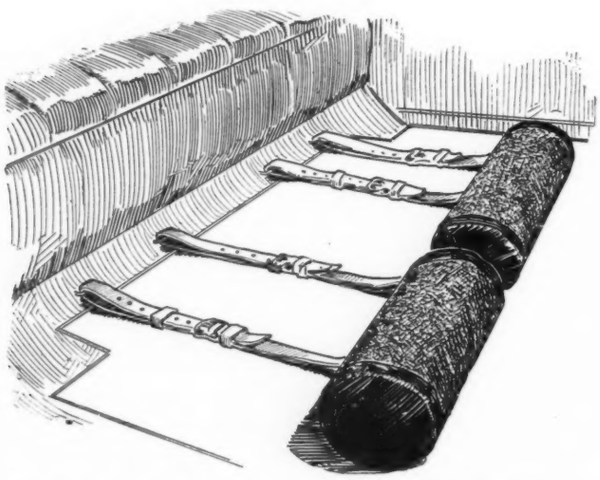


*Front view of Dupont touring car.*



*Instrument board in two sections on Brewster Country Club.*

end of the chassis bare. The dust shield, when well fitted, is certainly an asset; it gives a touch of completeness that justifies its use even if it did not serve a more serious purpose. This dressing up of the front now has been followed by dressing up of the rear end, as evidenced by the four examples mentioned.



***Foot rests in form of round pillows on Delage touring car.***

Large headlights were used extensively, and it is a question whether increasing the size of headlights has not been overdone. The best example of a light in harmony with its setting was on the Locombile touring car. The body of the lamp was painted blue to match the rest of the job, and only the rim was nickeled. There were other painted lamps, and except where the body of the lamp was black, they were an improvement over the all nickel finish.

Several of the bodies used cowl lights; there was a general absence of step lights, the touring bodies were without tonneau lights. The Renault was the only closed body to use pillar lamps. The use of ventilators on top of the cowl was general.

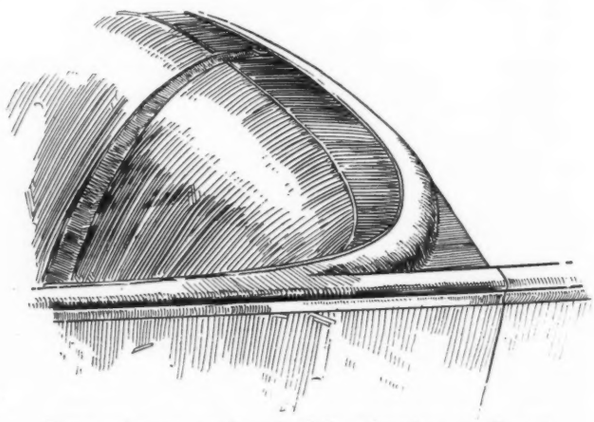
Nickel or silver finish was used on practically all the metal mountings and door handles, the exception being the black rubberized outside door handles and the gold finished interior mountings of closed jobs. The making of these mountings has progressed considerably during the last few seasons.

**INTERIOR FITTINGS**

Dome lights were limited to one in the centre, and that was of moderate size. The reading lamps also were medium sized. Rope robe sails, fastened with ends to correspond to the mountings, was the only style in closed bodies. Most of the touring bodies also used flexible robe rails. There were no bodies using the enamel finish mounting; the dull silver finish predominated, and in all cases the design was uniformly carried out on all the mountings of the body.

The trimming material on closed bodies was principally a wool fabric, the color conforming to French grey. The design in which the trimmings were put in the body was extremely plain. In only one case did the carpet line cross the door, coming up about three inches. One large body was trimmed with a two tone velour, but light shades were used almost exclusively. The touring bodies used leather, principally black, and the Brewster small car was alone in using cloth texture on an open body.

Window regulators were used on the doors, while the rear quarter light was generally worked by a lift strap. One car had the smoker's case on the instrument board and Brewster had a new type folding seat that went



***Form of rear cowl and plain trimming on Porter touring car.***

*Showing tapering upper part of door and outer panel, running out into a comparatively narrow edge (Revere).*

under the front seat, occupying less than the usual space.

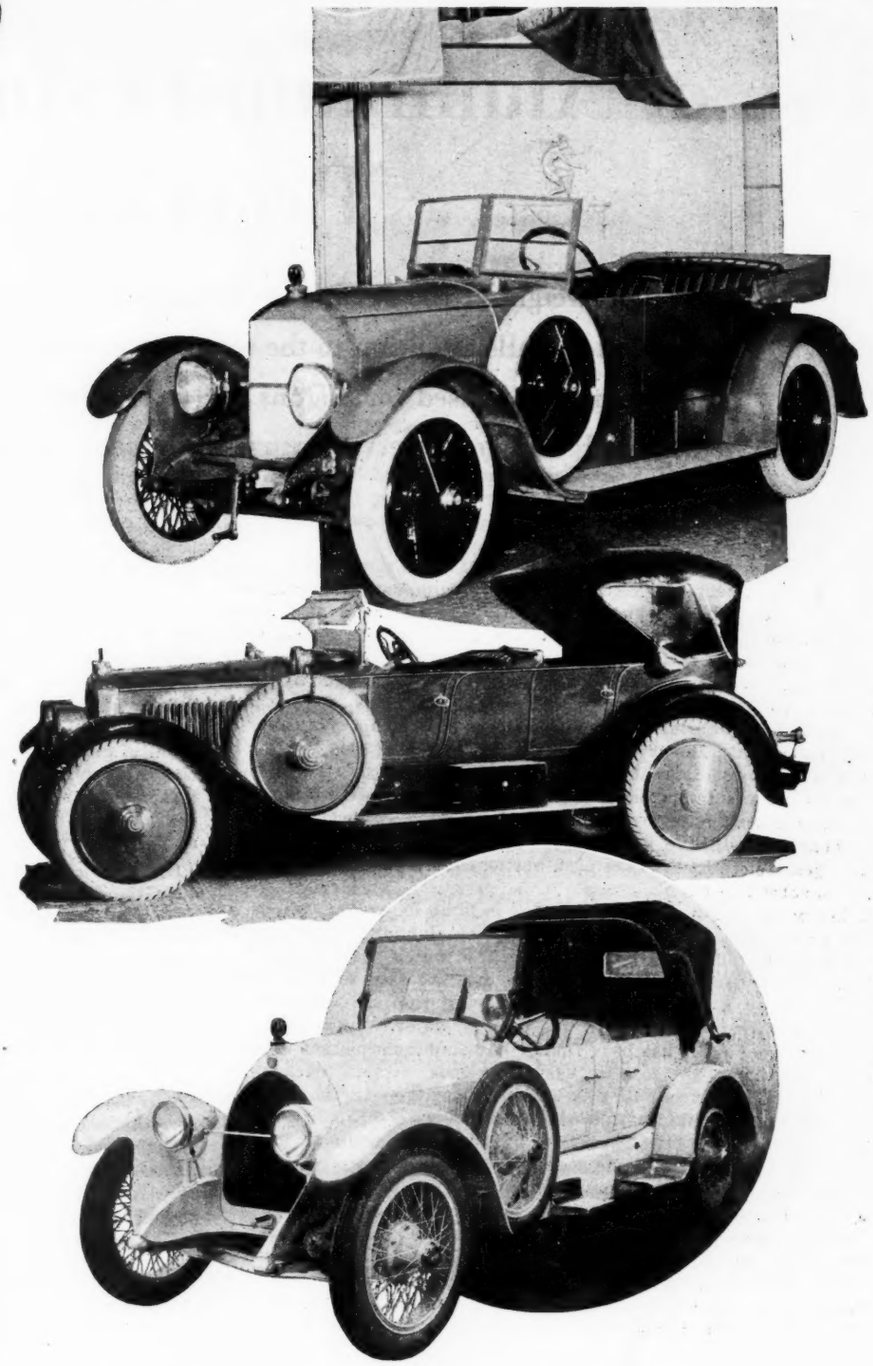
**COLOR SCHEMES**

The color schemes included more greens and light blues than usual, the familiar dark blue and black were used to some extent, and there were good combinations of lake and black, bronze green and black, grey and black, two tone greys, greens and blues. The best combination for closed bodies were those using decided contrasts, as the black upper and lighter shade below.

The Locomobile blue touring car was one case of a car finished in a single color looking well, no doubt largely because it was well striped, the striping giving the desirable contrast.

There was considerable striping on the bodies and engine hoods, and except where the stripe was wide and did not harmonize with the ground color it was a decided advantage. Some bodies had the stripe on the belt moulding when this was black, and the contrast was not as good as when the stripe was below the belt on the panel.

Wide stripes with hair lines of different color on the edges were used considerably and looked uniformly good. Comparison showed that the stripe was an improvement even when it did not follow the lines of the body.



*Meteor touring car with pointed radiator and windshield.*

*Brooks-Ostruk touring body with victoria top on Rolls Royce chassis.*

*Revere touring car built for King Alphonso of Spain. It has a victoria top and pigskin trimmings.*

## Industrial Commission

**THE announcement is made from St. Louis that the creation of an industrial adjustment commission in each State of the Union, with a national body as a "Court of Appeal," was urged before the American Mining Congress there by Allen Walker, of the Guaranty Trust Company of New York, in an address advocating a year's armistice between capital and labor.**

# Use of Aluminum Features in 1920 Premier

**The light weight of the Premier, when compared with cars of equal size, immediately calls attention to the material employed. One distinction is that aluminum is used for pistons and it is asserted that the sticking difficulty has been overcome. Unusual equipment of luxuries and conveniences in the body**

ONE of the noteworthy features of the Premier 1920 car is the exceptionally comprehensive equipment, including, besides the more usual articles, such items as two extra ribbed tread cord tires, two spot lights, duplex headlights, two built-in cowl lights for use when parked, two reading lights on touring as well as closed cars, rear door lights, two cigar lighters, Perfection heater in open as well as enclosed cars, Pyrene fire extinguisher, Gabriel snubbers, Kellogg tire pump, Waltham 8 day time piece, Boyce motometer and windshield cleaner.

The two most characteristic features of last year's Premier—the Lynite aluminum alloy engine and the Cutler-Hammer magnetic gear shift—are retained. For greater convenience in operation, a gear selecting finger lever on the steering wheel quadrant has been substituted for the push button control formerly mounted just below the wheel.

For a car of its size, the Premier is light in weight, which is due to the use of an aluminum motor with aluminum pistons, and of an aluminum gearbox. Difficulties which have operated against a wider use of aluminum engines are said to have been overcome by a patented design involving the use of cylinder liners in direct contact with the cooling water. Since this design was adopted it has been found that aluminum pistons can be used and fitted as close as cast iron ones without danger of sticking. The success of this design is ascribed to the method of packing the cylinder sleeves.

In the accompanying sketch, which shows the cylinder sleeve diagrammatically, it will be seen that a Velumoid gasket is provided at top and bottom and that a cork gasket is used in addition at the bottom. By backing the cork gasket up with the Velumoid gasket it is automatically tightened, since Velumoid has the property of swelling to triple thickness when wetted.

The valves are set with 0.012 to 0.014 in. clearance when the engine is running at its maximum temperature, 160 to 180 deg. F., according to the regulations of the Sylphon thermostatic valve. As soon as the motor is warmed up, the tappets operate quietly, it is claimed.

The rubbing surfaces on the rocker arms and the valve stem are wick oiled, hard felt wicks being provided and kept well oiled by the spray and vapor from the crankcase coming up into the chamber above the cylinder head. The wicks on the valve stems are said to make it possible to run the valves 10,000 miles without noticeable wear. The tip of the valve rocker arms is ground to a curve. A felt washer is placed on top of the valve spring so that the rocker arm rubs across it at every movement, and the same idea is worked out on the rocker arm shaft, where the felt washer in the shaft is placed at the point of maximum pressure.

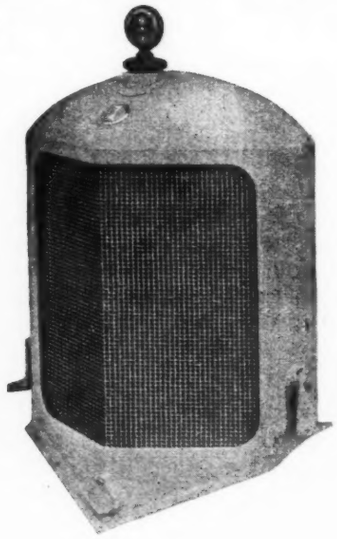
### THE COOLING SYSTEM

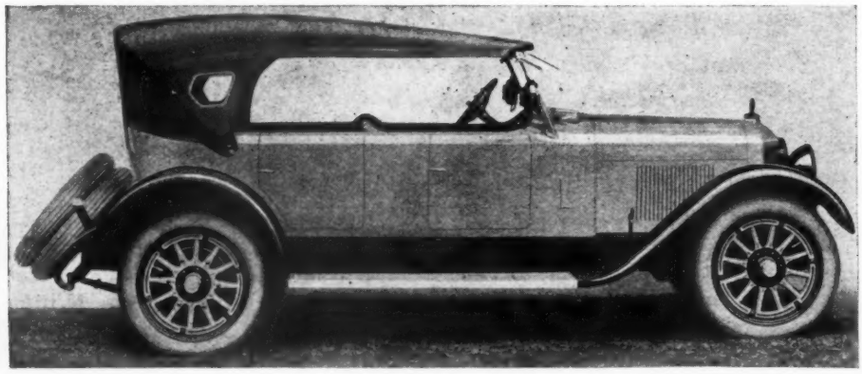
In the development of the cooling system the engine was run with 24 thermometers in the water jacket and records of the temperature observations were taken. As a result of these tests a water distributing tube was designed which insures uniformity of temperature throughout the jacket to within five degrees.

The water pump is mounted upon the front end of the cylinder block in such a manner that the water outlet forms the pump support. It is held in place by a single stud, so that the pump may be moved about in order to tighten the driving belt. The fan is mounted upon the outer end of the pump shaft and therefore the fan belt (a Graton & Knight V belt) drives both the fan and the pump. The V type radiator is mounted upon adjustable trunnions. It consists of a cast aluminum shell into which the core is fastened with cap screws so that it can be readily removed for repairs.

The power from the engine is transmitted to the rear wheels

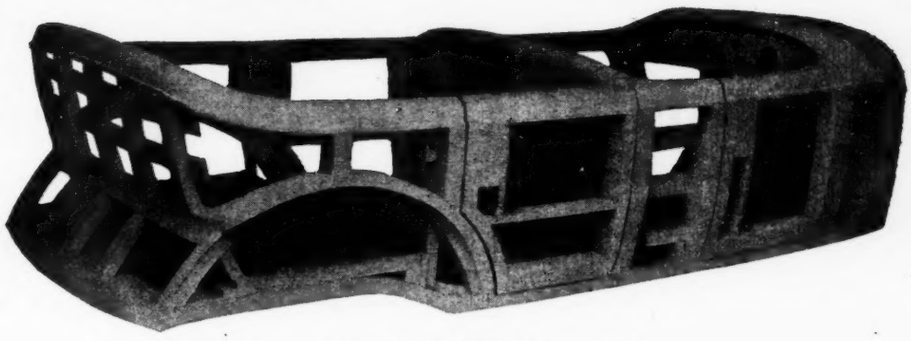
*Radiator assembly, showing aluminum casing and trunnion supports*





*Premier Model 6-D 4-passenger open car, equipped with a 6-cyl. 3⅜x5½ in. aluminum engine*

through a Borg & Beck dry disk clutch, Premier transmission and a tubular propeller shaft fitted with Peter's universal joints. The transmission shafts are now mounted upon annular bearings throughout, and the reverse idler gear has been increased in diameter so as to reduce the tooth pressure and so that Hyatt roller bearings (instead of a plain bushing) can be used. A Kellogg air pump for the tires is mounted on the side of the transmission case. The Peter's universal joints are self lubricating and do not have to be enclosed with a boot.



*Four-passenger open body frame structure*

The front and rear axles are of Standard Parts make. They are the heavy type and Bock roller bearings are used throughout. Spiral bevel gears are used for quietness.

The brakes are particularly large. Both external and internal bands are so designed as to prevent dragging. The brakes have a specially arranged linkage so that they are unaffected by the Hotchkiss drive. The drum diameters are 16 in. and the faces are 2½ in. wide, which figures out to one sq. in. of braking surface to each 9.3 pounds of car weight.

## ELECTRICAL EQUIPMENT

The starting, lighting and ignition equipment is Delco, so designed that no moving parts are visible. The switches are mounted upon the instrument board and provided with Sargent tumblerlocks. A Willard storage battery of 120 ampere-hour capacity is used in connection with this system.

The frame is so designed that the bodies rest on it directly without extension sills and without dust apron between the body and running board. Deep, heavy, invisible hinges, in conjunction with non-rattling door locks and a substantial body frame work, combine to give rigidity.

The windshield is framed by a heavy manganese bronze casting which is bolted to the top of the cowl. Since the windshield is 48 in. wide and the car tops are wide and overhanging, protection is afforded against light showers without resorting to side curtains. The lower section of the shield is stationary, while the double upper section, pivoting from the top, permits the use of the outside section as a shade and the inside section as a wind and rain protector.

The upholstering is very deep and comfortable. Hand buffed leather is used, with long straight piping backed by interlaced hair and supported by Marshall springs. The metal parts, such as door handles and fittings, are of solid nickel alloy metal (not plated). The tops in the open cars are of semi-Victoria design with nickel fittings, and have plate glass lights in the rear quarters as well as the back. The side curtains operate with the doors, while tonneau lamps illuminate both running boards and rear door sills in the open cars, and the closed cars have step lamps which switch on automatically as the doors are opened. The running boards, which are bolted directly to the underside of the frame, are covered with linoleum and trimmed with aluminum. They have Stanwood safety step plates front and rear on both sides, while on the foot board is a separate heel and foot rest for use when driving with the accelerator.

Continuing its past year's policy, the Premier company will manufacture only one chassis model (of 126¾ in. wheelbase) for the coming year, but this will be equipped with five different body types—four and seven passenger open touring bodies, a two passenger speedster and four and seven passenger closed bodies.

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**COMMERCIAL Attache Edwards, at The Hague, outlining new German tax measures, states that the law providing for the proposed general tax on sales which was introduced in the National Assembly simultaneously with the so-called National Emergency Sacrifice Tax, or property levy, is calculated to afford revenue to the possible extent of 4,000,000,000 marks by taxing all sales at rates varying from 1 per cent to 10 per cent.**

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**THE announcement has been made from Grand Rapids, Mich., that the National Grange brought its annual convention to a close there with the adoption of resolutions demanding a national highway construction program under a single administrative department and reasserting a disclaimer of responsibility for present high living cost.**

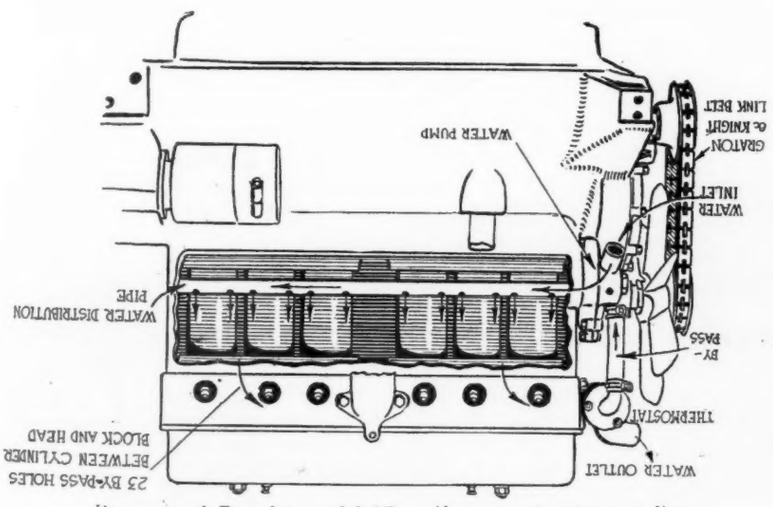
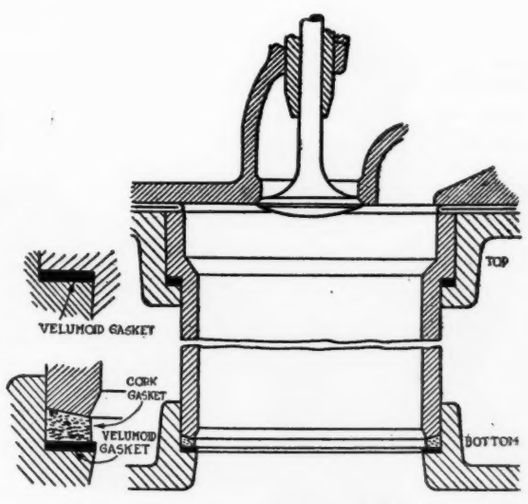



*Diagram of Premier model 6D uniform temperature cooling system*




*Cross section of top and bottom of Premier cylinder sleeve packing*

# Internal Gear of Kennedy Axle Immersed in Oil

**This newest of truck axles was designed during war times for an old firm that had decided upon truck axles as a peace time product. Besides the oil bath, a new construction is that for torque shock absorption. Braking surfaces are of unusual size. Option is given for one or two sets of double expanding, cam operated shoes**

THE "reconstruction period" so far has yielded a considerable number of new truck axles and, curiously enough, practically all of these are of the internal gear-drive type. The newest line is to be known as Kennedy, named after the Kennedy brothers, officials of the Hero Manufacturing Co.

This company, with a record of more than 50 years of successful manufacturing, decided upon a truck axle as a peace-time product while the war was in progress, and engaged Joseph A. Anglada, consulting engineer, to study existing axle designs, as well as motor truck construction in general. The design adopted is of the internal gear type.

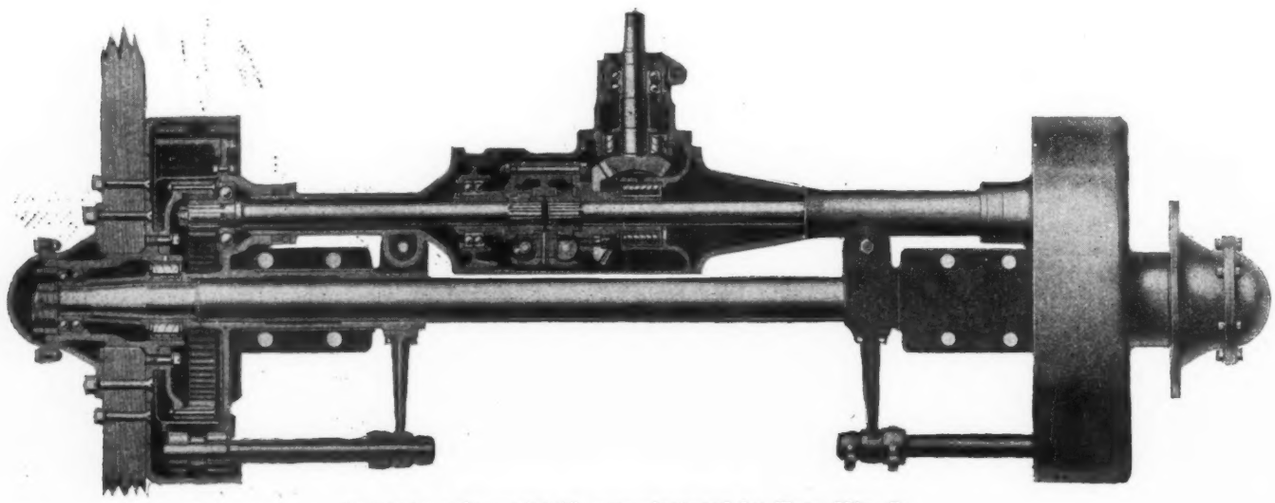
Certain new features have been introduced in the design. One of these is a form of construction that keeps the internal gear and pinion immersed in a bath of oil. The design is such that it permits the oil to circulate freely through the housing from the hub bearings of one wheel to the hub bearings of the other. The manufacturers claim that with this constant lubrication, the life of the ring gears and pinions will be fully as great as that of a worm in a worm-drive axle, and longer than the life of the worm gear in heavy duty trucks.

Another distinctive feature is the provision for torque shock absorption. Four coiled springs are connected with the jack-shaft housing in such a manner as to permit of a slight rotation of the housing, thus causing the absorption by these coiled springs of the shock occasioned by changes in torque due to the application of propelling or breaking power. This torque cushion is claimed to be far superior to a rigid torque bar. Although the axles are furnished without radius rods, these can be attached if desired.

### LARGE BRAKING SURFACE

Special attention has been paid to securing extra large braking surfaces. An option is given of one or two sets of double expanding, cam-operated shoes. A propeller shaft brake can also be furnished, if desired. The Powrlock, self-locking differential is fitted as standard equipment. Hyatt roller and double annular ball bearings are used on pinion shaft, differential and wheels.

The springs can be either underslung or overslung. Attention has been paid also to the demand for varied spring centers. Steel or wood wheels and either solid or pneumatic tires can be used with this axle. The hub flanges are of such construction as to reinforce the wheels against side strains.



*Kennedy axle model 25, manufactured by Hero Mfg. Co.*

Four sizes of this axle are now being produced by the company.

Model 57, for ¾-ton trucks, load limit on spring pads, 2,150 lb.

Model 15, for 1½-ton trucks, load limit on spring pads, 4,200 lb.

Model 25, for 2½-ton trucks, load limit on spring pads, 7,500 lb.

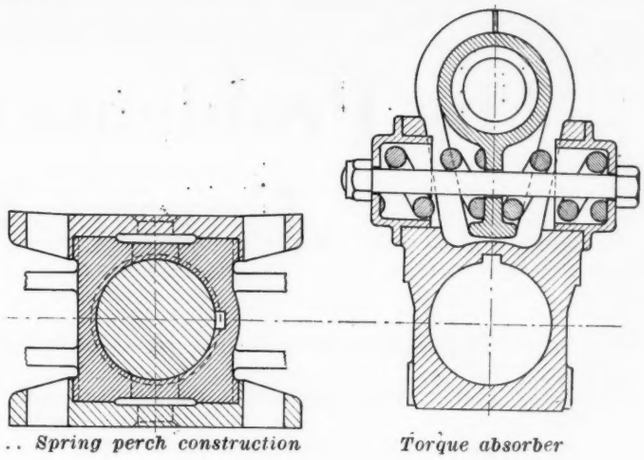
Model 35, for 3½-ton trucks, load limit on spring pads, 13,000 lb.

**MAXIMUM LOADS**

The maximum allowable horse powers for the different models are as follows: ¾-ton, 22 h.p.; 1½-ton, 25 h.p.; 2½-ton, 35 h.p.; 3½-ton, 50 h.p. The weights are 270 lb. ¾ ton; 395 lb. 1½ ton; 565 lb. 2½ ton; 780 lb. 3½ ton.

Larger sizes will be brought out later.

The following table gives the specifications for three sizes of Kennedy axles:



.. *Spring perch construction* *Torque absorber*

| | 1½-ton | 2½ ton | 3½ ton |
|---|---|---|---|
| Limit of load on spring pads | 4,200 lb. | 7,500 lb. | 13,000 lb. |
| Tread | 56 in. | 60½ in. | 65 in. |
| Maximum allowable horse power (Denby-Marshall formula) | 25 | 35 | 50 |
| Standard gear ratio | 7 to 1 | 8.3 to 1 | 11 to 1 |
| Optional gear ratios | 5½ to 1 | 6.4 to 1 | 9 to 1 |
| | 6 to 1 | 10.4 to 1 | 10 to 1 |
| | 8 to 1 | 12.3 to 1 | 12 to 1 |
| Standard spring center | 39 in. | 40 in. | 42 in. |
| Maximum spring center | 41 in. | 42 in. | 44 in. |
| Minimum spring center | 37 in. | 38 in. | 40 in. |
| Standard width of springs | 2½ in. | 3 in. | 3½ in. |
| Optional width of springs | 2 to 3 in. | 2½ to 4 in. | 4 in. |
| Diameter spring clip | ¾ in. | ⅞ in. | 1 in. |
| Standard fore and aft clip spacing | | 4¾ in. | |
| Dead axle diameter | 2 3/16 in. | 2⅝ in. | 3¼ in. |
| Wheel spoke widths | 2¼ in. | 2 or 2½ in. | 3 in. |
| Number of spokes per wheel | 14 | 14 | 14 |
| Bore of wheel at hub | 5⅜ in. | 5½ in. | 7 in. |
| Diameter of hub flange | 11 in. | 12 in. | 13⅜ in. |
| Brakes—Option of one or two sets of double expanding cam-operated shoes 2 in. wide in 21 in. diameter, wheel drum with or without a propeller shaft brake with 5 in. face and 8 in. diameter | 19 in. diam. | 21 in. | 24 in. diam. |
| Bearings—Combination of roller and double annular ball bearings on pinion shaft, differential and wheels. Standardized mounting. | | | |

# New York-London Airship Line

(*Continued from Page* 1103)

by wireless communication between two cities.

In operating airships and airplanes for long distance transport, the report goes into detail to show that the airship can carry more passengers and larger quantities of express mail, provide more comfort, insure greater safety and approximate the speed of the airplane for a great distance.

Airplane service between New York and London would call for a crew of seven men to each plane, weighing with food and personal effects 1330 lbs., allowing the carriage of 20 passengers, if the plane was constructed capable of carrying a total load of 40 tons. The cost of running the service (it would demand twenty-eight airplanes to equal four of the contemplated airships) would total $19,300,000. Depreciation charges, figuring the airplane at three years of useful life and sheds at 20 years, with workshops at 3 per cent depreciation a year, and the planes valued at $700,000 each and sheds at $150,000 each, would total $5,314,000 as compared with $2,650,000 for the necessary number of airships.

Insurance premiums would total $1,170,000 as compared with $617,500 for airships; annual establishment expense $303,000 as against $130,000; repairs and maintenance $75,000 as against $125,000, with the total annual charges amounting to $8,992,500 for airplanes in comparison to $5,000,000 for the airships. The rate of carrying 20 passengers by airplane from London to New York it is estimated would be $575 per head while by airship it would approximate $240 per head and the rate for mail by airplane is placed at $5,500 per ton as against $2,125 by airship.

To emphasize further the extent to which the rigid airship can be used, the report dwells on the employment of ships by Germany prior to the war when the German Air Travel Co. operated five airships for 826 flights of 1853 hr. over 102,675 miles, carrying 17,221 passengers in spacious and luxurious quarters, at the rate of $25 per passenger over short distance excursions of from two to three hours. These ships carried thirty passengers each, in addition to crews of eight, and were so profitably employed that places had to be booked days ahead.

# The Problems in Designing an Engine Camshaft

**This is the second and final instalment of the article by Mr. Hastings on the interesting and complicated work of making a proper camshaft. If you read the previous instalment, of course, you will read this one and if you did not read that of last week, the best thing to do is to turn back and read it. This is an important contribution to engine literature**

## PART II

By Don T. Hastings

A COMPARISON of the action obtained from a tangential and a mushroom cam is shown in Fig. 6. The two cams give the same lift and use the same timing angle and clearance.

This is old-style practice as far as the clearance is concerned and explains in part why many valve mechanisms are so noisy.

Considering first the lift diagrams, that of the mushroom cam shown in dotted lines has considerably the more rapid opening until nearly the full lift is reached. The area under this dotted curve and above the base line, which is a measure of the effective valve opening, is much larger than that for the tangential cam and consequently the results obtained for a given size valve should be better in this respect with the mushroom tappet.

The velocity diagrams show that, while the tangential cam gives the greater maximum velocities, its velocity is lower when the valve is seating with a given clearance ABOVE THE BASE CIRCLE. The velocity due to the mushroom cam is from ⅓ to ½ greater with clearance from 0.002 in. to 0.016 in. As the noise caused by the valve when seating is proportional to the velocity of the valve, the tangential cam is somewhat better in this respect, although at best there is bound to be some noise where the clearance is taken outside the base circle.

The acceleration diagrams show much greater initial positive acceleration with the mushroom cam, but considerably lower negative acceleration or deceleration. As it is the deceleration which determines the valve spring pressure required, the mushroom cam is considerably superior in this respect. Attention is called to the fact that this acceleration diagram is theoretically incorrect as shown—the right hand half is turned upside down from its proper position. When the valve starts to descend its velocity increases from zero to a maximum; consequently it has positive acceleration followed by deceleration when the velocity begins to decrease. The diagram as drawn, however, is much easier to understand, due to its symmetry and, for ordinary purposes, no confusion can result.

The effect of the dwell in the tangential cam is clearly shown in these diagrams. The valve remains wide open during nearly 8 deg. of camshaft travel, with the result that, during that period, the velocity and acceleration are both zero.

The acceleration diagrams both illustrate the desirability of checking the valve spring pressure at the point of maximum velocity; that is, where deceleration begins. In each case, the deceleration is nearly as great at this point as with the valve wide open, while particularly with the mushroom cam the spring pressure will have decreased quite appreciably, due to the lengthening of the spring as the valve descends.

Fig. 7 shows lift, velocity and acceleration curves for mushroom inlet and exhaust valves which are performing satisfactorily on thousands of passenger cars built in the last 3 years. Attention is called to the fact that a considerably increased effective exhaust valve opening could have been secured by using the same radii for flank and top of the exhaust valve cam as for the inlet, thus giving the exhaust valve 12 deg. dwell with valve fully opened. The curve of exhaust valve lift would then have been the same as that of the inlet up to its intersection with the center line of the inlet cam—from that point it would have been parallel to the base line over to the center line of the exhaust cam.

The maximum velocity of the inlet valve is slightly greater than for the exhaust and occurs somewhat earlier in the lift.

The greatest difference between the actions resulting from the two cams is found in the positive acceleration, which is nearly twice as great for the inlet as for the exhaust. The negative accelerations and, consequently, the required spring pressures differ but slightly. Duplicate springs are used on exhaust and inlet valves in any case, so there seems no good reason for using the round nosed exhaust cam in preference to one with 12 deg. dwell and same flank and top radii as for the inlet.

The cams shown in Fig. 7 illustrate modern practice in handling the clearance. Reference to this will be made again below.

Fig. 8 shows diagrams for two constant acceleration cams having the same timing angle of 115 deg. on the camshaft, same lift of 0.375 in., dwell of 15 deg., roller

radius of 0.4375, etc., but differing in the portion of the lift angle devoted to deceleration. The right hand half of the cam figure shows the normal constant acceleration cam in which acceleration and deceleration are equal, i. e., the portion f of the lift angle devoted to deceleration is 0.5. The left hand half of this figure shows a cam in which $f = 0.6$.

The diagrams show that the cam having $f = 0.6$ has greater effective valve opening area, the same maximum velocity, greater positive acceleration, which is unimportant, and 1/6 less negative acceleration and spring pressure required, which are of great importance.

The serious objection to this type of cam in general and to the one with f greater than 0.5 in particular is the increased cost and decreased rapidity of production due to the small grinding wheels required for the concave sides. The maximum diameter of wheel which could be used for the cam shown on the right hand side is only 4 in., while for that on the left, 2¾ in., is about the limit. Compared to the 10 in. to 18 in. wheels which are regularly used, these are very small and present a most serious shop problem. This is discussed later more at length.

The lift curve of the constant acceleration cam, if plotted with those of tangential and mushroom cams of same angle, lift, etc., would be found to lie between the other two, as would the acceleration curve, and, consequently, the spring pressure required.

### Comparison of Spring Pressures

A comparison of the spring pressures may be of interest. Assume the following data:

$W = 1$ lb $\quad N = 1500 \quad R = \frac{1}{2}$ in. $\quad r = \frac{1}{8}$ in.

$D = \frac{7}{8}$ in. $\quad l = \frac{3}{8}$ in $\quad \frac{\phi}{2} = 50$ deg. $\quad f = 0.5$

Then the spring pressures are as follows:

Tangential cam

$$F = \frac{WN^2}{35200}\left(\frac{D^2}{R+r} + D\right) = \frac{1 \times 1500^2}{35200}\left(\frac{\frac{7}{8}^2}{\frac{1}{2}+\frac{1}{8}} + \frac{7}{8}\right) = 134 \text{ lb.}$$

Constant acceleration cam

$$F = \frac{WN^2 l}{5.36\, f \left(\frac{\phi}{2}\right)^2} = \frac{1 \times 1500^2 \times \frac{3}{8}}{5.36 \times .5 \times 50^2} = 126 \text{ lb.}$$

Mushroom cam

$$F = \frac{WN^2 D}{35200} = \frac{1 \times 1500^2 \times \frac{7}{8}}{35200} = 56 \text{ lb.}$$

It must, of course, be understood that in other cases the relative spring pressures will be quite different, although that for the mushroom cam will be least and for the tangential cam, greatest for all ordinary conditions.

Lift diagrams can usually be constructed with fair accuracy by working to a scale of 20 to 50 times actual size. The better practice, however, is to compute a sufficient number of points on the curve and then plot it from the figures. This is the procedure that must be followed to obtain even fair accuracy in the velocity and acceleration curves.

The computation of a large number of values of velocity and acceleration is at best a laborious proposition—the values of $\frac{1}{12}\left(\frac{\pi N}{60}\right)$ and $\frac{1}{12}\left(\frac{2\pi N}{60}\right)^2$ together with their logs for values of N up to 1500 given in Table II, may be of material assistance in this work.

### Clearance and the Quieting Curve

One of the serious problems on modern engines is securing quiet valve action. There are two causes of noise from the valves—the blow struck by the valve on its seat if allowed to make contact with any great velocity and the blow struck the end of the valve stem by the tappet, or its equivalent in certain constructions, the blow of the cam against the tappet when the clearance has been completely taken up preparatory to lifting the valve from its seat. There is, of course, a third possible source of noise in a weak valve spring permitting the valve and tappet to jump, i. e., not remain in contact with the cam, but this is the result of poor designing or inspection and should never occur in a first-class engine.

The noise due to the valve seating is by far the more serious, due to the greater weight involved and to the blow being struck on the cylinder or cylinder head casting which transmits the sound very readily. The noise of the tappet striking the valve stem is merely a click which can be distinguished only by experts or by the aid of delicate instruments.

Clearance is, of course, absolutely necessary, as explained above. The old style practice of taking up the clearance outside of the base circle, that is, on the lift curve proper, resulted in the valve seating with relatively high velocity—for instance, if 0.005 in. clearance were taken up outside the base circle in either of the cams shown in Fig. 8, the velocity of the valve on seating would be about 1.5 ft. per sec., or one-eighth of the maximum valve velocity. If the clearance is taken up inside the base circle, however, the velocity is reduced to less than one-half of this amount, with consequently a great decrease in the resulting noise.

The quieting curve is the name given that portion of the cam outline between the point of opening (or closing) of the valve and the point where the follower comes in contact with the radius, forming the major portion of the cam outline when the clearance is taken up inside the base circle. It consists of a circular arc with its radius equal to about two-thirds the radius of the base circle tangent to the base circle at the same point as the lift curve proper and connected to the inner clearance circle by a common tangent. It is in reality a tangential cam outline of very short flank and very large top radius and, consequently, the formula listed above for the tangential cam may be applied in determining the action resulting from this construction.

The small diagrams in the upper right hand part of Fig. 8 show the results obtained on either of the cams detailed in this illustration. The maximum velocity occurs when the tappet has moved upward only 0.0029 in. from the clearance circle and then has a value of only 1 ft. per sec. Assuming that the clearance was exactly 0.015 in., this means that, with 0.0121 in. of the clearance still to be taken up, the velocity is only about two-thirds as great as would be the case if only 0.005 in. clearance were allowed outside the base circle. In other words, if the clearance were reduced to 0.0029 in. through expansion of the valve, or for any other reason, instead of the 0.015 in. contemplated, the velocity of seating would be only two-thirds as great as if 0.005 in. were used outside the base circle.

If the clearance was 0.010 in. instead of the 0.015 in. allowed, thus permitting the valve to seat at a point 0.005 in. inside the base circle, the velocity would be only 0.65 ft. per sec. as against the 1.50 ft. resulting when the clearance is outside the base circle.

The acceleration with the follower in contact with the tangent line is positive, as with the tangential cam, so the follower will always remain in contact with the cam during this period. The acceleration is negative during the contact of the follower with the radius of the quieting curve, and consequently the follower will jump away from the cam if this acceleration is greater than that due to gravity. In Fig. 8, at the speed of 3000 r. p. m. of the crankshaft, the maximum value is 509.43 ft. per sec. The acceleration at 750 r. p. m. of the crankshaft is 31.84 ft. per sec.$^2$, slightly less than that due to gravity, 32.16. At

## Table 2

| N | $\frac{1}{12}\left(\frac{2\pi N}{60}\right)$ log | $\frac{1}{12}\left(\frac{2\pi N}{60}\right)$ | $\frac{1}{12}\left(\frac{2\pi N}{60}\right)^2$ log | $\frac{1}{12}\left(\frac{2\pi N}{60}\right)^2$ |
|---|---|---|---|---|
| 100 | 0.872665 | 9.9408474 | 9.13852 | 0.9608760 |
| 200 | 1.74533 | 0.2418774 | 36.5541 | 1.5629360 |
| 300 | 2.6180 | 0.4179687 | 82.2467 | 1.9151185 |
| 400 | 3.49056 | 0.5429074 | 146.216 | 2.1649960 |
| 500 | 4.36332 | 0.6398174 | 228.463 | 2.3588160 |
| 600 | 5.23599 | 0.7189987 | 328.987 | 2.5171785 |
| 700 | 6.10865 | 0.7859454 | 447.788 | 2.6510721 |
| 800 | 6.98132 | 0.8439374 | 584.866 | 2.7670560 |
| 900 | 7.85398 | 0.8950899 | 740.220 | 2.8693610 |
| 1000 | 8.72665 | 0.9408474 | 913.852 | 2.9608760 |
| 1100 | 9.59931 | 0.9822401 | 1105.76 | 3.0436614 |
| 1200 | 10.4720 | 1.0200286 | 1315.95 | 3.1192385 |
| 1300 | 11.3446 | 1.0547908 | 1544.41 | 3.1887627 |
| 1400 | 12.2173 | 1.0869754 | 1791.15 | 3.2531321 |
| 1500 | 13.0900 | 1.1169387 | 2056.17 | 3.3130586 |

speeds up to 750 r. p. m. consequently, the tappet will follow the cam on the clearance curve—at speeds above this the tappet will jump and strike the came again at about the time that the clearance is all taken up. This jumping is not serious, however, any slight noise resulting from it being indistinguishable at these speeds. Occasionally, a light auxiliary spring is fitted to the tappet but this is entirely unnecessary and need never be considered.

The principle underlying the quieting curve is to provide a portion of the cam outline adjacent to the desired points of opening and closing of the valve, giving very small lift during a considerable number of degrees travel, so that the velocity of the valve seating is low for several thousandths variation in clearance. The actual shape of the quieting curve need not be a circular arc and tangent as described above. Experience has shown that a lift curve of 0.0001 in. to 0.0005 in. rise per degree of camshaft travel is satisfactory in reducing noise, also for ordinary engines a period of 15 degrees camshaft travel is about right for the length of the quieting curve on each side of the cam.

An interesting case occurred recently in a truck engine in which the clearance of the exhaust valves varied from 0.016 in. with the engine cold to only 0.003 in. when the engine had pulled a heavy load for a considerable period. The cams for this engine were old style, having the clearance allowed outside the base circle. The inevitable result was extremely noisy valves when the engine was cold or even working under average loads. Redesign of the cams to take the clearance inside the base circle gave practically noiseless operation with the engine cold and only slightly greater noise as the clearance decreased under load. Not only was this mechanically better, but it removed one of the arguments against the truck with which the sales department had had to contend.

The effect on the valve timing of the quieting curve as the clearance is decreased below that for which the cams were designed is to lengthen slightly the period during which the valve is open. The effective valve opening during the additional periods of opening is so small, however, due to the lift of only a very few thousandths of an inch, that there is no measurable effect on the engine performance.

The variation of clearance in a given engine cannot be predicted with any great accuracy but must be determined by actual tests. One example of extreme clearance change was given above for a truck engine in which the clearance decreased as the engine warmed up. Data was published recently concerning an engine having overhead valves operated by rocker levers and long push rods from a camshaft in the crankcase. It was stated that, with the valve operating mechanism enclosed by the regular cover plates, there was absolutely no change of the clearance with temperature. With the cover plates removed and air blowing on the long push rods, the clearance increased as the engine warmed up.

One of the well known cars has a decrease of 0.001 in. to .0015 in. in clearance as the engine warms up. The cams in this engine are designed for .003 in. clearance with a quieting curve. The factory sets the tappets to .004 in. clearance cold, getting fairly quiet operation under practically all conditions. In addition, the equipment of each car includes a thickness gage 0.004 in. thick for use in resetting valve clearances when necessary. The better practice would probably be to set the clearance at 0.003 in. to 0.0035 in., thus obtaining normal running clearance between 0.002 in. and 0.003 in., the valve closing while the tappet is in contact with the quieting curve.

When the quieting curve consisting of the circular arc and tangent line is used on a mushroom cam, as shown in Fig. 7, the formulae listed above for the mushroom cam apply to the action of the cam while the tappet is in contact with the circular arc of the quieting curve. There is, of course, no motion given to the tappet by the tangent. Slightly better results would be obtained in this case by making the quieting curve a true mushroom cam shape, using a circular arc to connect the arc of the quieting curve to the clearance circle. The radius of this arc must, of course, be greater than the radius of the clearance circle and can for convenience usually be made equal to the diameter of the clearance circle. The result of this construction is to increase the angle covered by the quieting curve and to make all the formulae for the mushroom cam applicable. It also makes the lift slightly more gradual over part of the quieting curve.

The lengths of the tangents in quieting curves as described above for cams of average base circle diameter may be of interest. That in Fig. 7 has a length of only 0.033 in. and that in Fig. 8 about 0.076 in. The latter represents about the maximum which will occur as the

## Table 3

| Angle from center line of cam | Inlet valve lift | Exhaust valve lift |
|---|---|---|
| 0 | 0.170 | 0.173 |
| 3 | 0.169 | 0.173 |
| 6 | 0.1655 | 0.173 |
| 9 | 0.161 | 0.173 |
| 12 | 0.1545 | 0.173 |
| 15 | 0.145 | 0.172 |
| 18 | 0.135 | 0.1685 |
| 21 | 0.123 | 0.164 |
| 24 | 0.108 | 0.1575 |
| 27 | 0.092 | 0.148 |
| 30 | 0.0745 | 0.138 |
| 33 | 0.055 | 0.126 |
| 36 | 0.040 | 0.111 |
| 39 | 0.029 | 0.095 |
| 42 | 0.0215 | 0.0775 |
| 45 | 0.0175 | 0.058 |
| 48 | 0.016* | 0.043 |
| 51 | 0.0145 | 0.032 |
| 54 | 0.0125 | 0.0245 |
| 57 | 0.0075 | 0.0205 |
| 60 | 0.0015 | 0.019* |
| 63 | ..... | 0.0175 |
| 66 | ..... | 0.0155 |
| 69 | ..... | 0.0095 |
| 72 | ..... | 0.003 |
| 75 | ..... | ..... |

radius of the arc is fairly small and the clearance allowed very large.

An interesting set of figures for cam lift involving large clearances and the application of the principle of the quieting curve is given in Table 3. These cams were presumably laid out with certain objects in view, although the data on which they were based is not available. It will be noted that, at 0.016 in. lift in the case of the inlet valve and 0.019 in. for the exhaust, the change in the lift for the 3 deg. period each side of these points is only 0.0015 in., or about one-half thousandth of an inch per degree. This is about the maximum lift per degree which can be used and still secure quiet valve action in a high speed engine. It will also be noted that the exhaust cam has a period of dwell of about 24 deg.

### Camshaft Stiffness

Any deflection of the camshaft under the pressure applied to the tappets to open the valves or at the time of closing will affect the clearance and, accordingly, may cause the valves to be noisy, even though the clearance is properly set and the cams are designed for quiet action. This was not generally appreciated in the past and camshafts were made quite small in diameter between the cams and the bearings, with the result that they were quite flexible. The present tendency is toward increased diameters with resultant greater stiffness. This is very desirable, particularly where extreme efforts are being made in cam design to obtain quietness, but still further increases in diameter can be expected as the importance of this factor becomes more generally understood.

The camshaft may be considered as a beam of circular section supported (usually) at three points and having an overhung end to which the driving force is applied. Loads are applied to the shaft between bearings on the centerlines of the several cams, the loads varying in each case during the period while the valve is open. An exact analysis of the conditions of bending and consequent deflection would be a complicated mathematical process and is not worth while. A fair approximation can be made quite easily, however, by the use of the formula

$$\text{Deflection} = \frac{P\,l^3}{8{,}800{,}000\,d^4}\,(2X^4 + 2X^3 - 4X^3) \quad \ldots\ldots (45)$$

in which

P = load in pounds on any cam
l = distance center to center of bearings between which cam is located
d = diameter of shaft between cams
X = the fraction of the distance l on the cam from the farther bearing

For convenience, the values of the parenthesis corresponding to various values of x are given herewith:

| x | $(2X^4 + 2X^3 - 4X^3)$ | x | $(2X^4 + 2X^3 - 4X^3)$ |
|---|---|---|---|
| 0.50 | 0.125 | 0.75 | 0.069 |
| 0.55 | 0.122 | 0.80 | 0.051 |
| 0.60 | 0.115 | 0.85 | 0.033 |
| 0.65 | 0.104 | 0.90 | 0.016 |
| 0.70 | 0.088 | 0.95 | 0.005 |

The load on the inlet cam will be the sum of the spring pressure and the inertia force of the valve, tappet, etc., computed as was the required spring pressure for that point of the lift at which the positive acceleration is greatest. The load on the exhaust cam may be greatest at either of two points—at the point of greatest positive acceleration, the same as for the inlet cam, or at the start of the lift when the valve is held to its seat by the pressure inside the cylinder. In the latter case, about 50 lb. per sq. in. of valve head area should be allowed for the pressure and added to the sum of the spring pressure corresponding to the closed valve and the inertia force for the beginning of the lift. This inertia force is

$$F = \frac{W}{32.16} \times \text{acceleration for } \theta = 0 \quad \ldots\ldots (46)$$

In a four-cylinder engine with a single camshaft and firing order 1, 2, 4, 3, there may be pressure on either two or three cams at the same time—under no conditions is there pressure on only one cam at a time. If these pressures are on opposite sides of the center bearing, the deflection will be less than if they are both on one side. In this case, for instance, No. 1 inlet, No. 2 inlet and No. 4 exhaust are all open at the same time, the two inlet valves being on one side and the exhaust at the other side of the center bearing. At another time No. 1 inlet and No. 2 exhaust are open at the same time, both on one side of the center bearing. The third condition is No. 1 exhaust, No. 2 exhaust and No. 3 inlet all open at once. In this case the center bearing is between the inlet cam and the two exhaust cams. No prediction can be made as to which of these combinations will cause the greatest deflection—check all of them and base the shaft diameter on that giving the greatest deflection.

The best way to proceed is to assume a shaft diameter and compute the deflection for a load on one cam. Then compute the deflection for a load existing at the same time on a second cam on the same side of the center bearing. Add these deflections and ignore the effect of the load on the opposite side of the center bearing. If the deflection is more than 0.001 in., the size of the shaft should be increased if possible, particularly if extreme silence is desired, unless extreme allowance can be made in the way of ample clearance and a satisfactory quieting curve.

Camshafts for six and twelve-cylinder engines present a still more complicated problem but the deflection can be computed approximately by careful analysis of the pressures existing at the same time and further application of the method described above.

### Valve Lift

The vast majority of modern high-speed engines have the lift of the valve between 5/16 in. and 3/8 in. Lifts greater than 3/8 in. cause much more trouble in keeping valves quiet and also necessitate the use of much stronger springs. Wear of the various moving parts also becomes a serious factor with increased lift.

The cost of the engine also has a limiting effect both on valve lift and camshaft diameter. Modern shafts, as shown in Fig. 11 and 12, have the bearings enlarged so that the tops of the cams are inside the diameter of the bearing. They also have the bearings graduated in size by 1/32 in. or 1/16 in., so that the shaft can be readily slipped into position endwise. As the body diameter of the cam is always greater than the shaft diameter to give clearance for grinding, any increase in shaft diameter means an increase in cam base circle diameter. This means increased bearing diameter with greater cost for bearings, larger and heavier and therefore more costly crankcase. Increasing the lift also means larger bearings with the same effect on cost.

A few engines are, of course, built with lift greater than 3/8 in., but they are almost exclusively those in which noise and cost are minor items. A description of an airplane engine was published recently which stated that the valve lift was .700 in. This design must have presented some very interesting problems before it was successfully put into use.

### Location of Shaft in Engine

Camshafts are placed either in the crankcase or above the cylinder head. If in the crankcase, they are inserted endways, the bearing seats being made large enough to permit the cams to pass freely. The space between the bearings is usually left open with the rest of the crank chamber, so that the oil spray thrown off by the crankshaft and connecting rods and the oil mist always found

in the crankcase will lubricate the cams and tappets. In this case the bearings are usually fed by oil under pressure.

In some recent designs, the space between the bearings is enclosed, resulting in the shaft running in a tube. This tube is then kept partially filled with oil, insuring lubrication of the cams and tappets. In either of these designs, the bearings on the shaft are enlarged to a diameter greater than that of the peak circle of the cams.

Overhead shafts may be mounted endways the same as described above, or may be carried in bearings fitted with caps, in which case it is unnecessary to enlarge the bearings. Overhead shafts frequently run in troughs which are kept partly filled with oil or, in other cases, are hollow and serve as oil tubes, lubricant being fed to the bearings by means of radial holes.

The use of hollow shafts is, of course, not restricted to the overhead position, as they are occasionally used in the crankcase.

### Cam Dimensions

The widths of cams vary from about ¼ in. to 1½ in., the extremely narrow cams being used on airplane engines where weight is so important and the wide cams on tractor and other comparatively slow speed, heavy-duty engines. The usual width for cams having roller followers is ½ in. and for mushroom cams ¾ in.

The radius of the flank for mushroom cams varies from 1 7/16 in. to 6 in., with the usual figures from 2½ in. to 4 in. Radii larger than 4 in. make the acceleration very great with much more chance of noise if the clearance is not accurately adjusted.

The top radius varies from about 3/64 in. up to ⅜ in., depending to a large extent on the lift, dwell and flank radius chosen for a cam of given lift angle.

The diameters of rollers for the followers of tangential and constant acceleration cams vary from ¾ to 1¼ in., with the average about 15/16 in.

Base circle diameters run from ⅞ in. to 1½ in., the average on new camshaft designs being about 1¼ in.

## PART II

### Camshaft Manufacturing

The manufacture of camshafts is one of the most highly specialized branches of engine construction. Special machines have been built for this purpose and special tools and processes are used to secure the accurate results required. The most painstaking attention to detail is exercised at all times, with the result that modern shafts are fine specimens of workmanship.

The shafts are carefully inspected after each important operation and also after completion, a number of special instruments and fixtures being provided for this purpose.

Camshafts are forged of plain carbon open-hearth steel of the following analysis:

Carbon, .15%-.25%.
Manganese, .30%-.60%.
Phosphorus, not over .04%.
Sulphur, not over .04%.

The forgings are ordered from the forging manufacturer by the engine builder and delivered to the camshaft manufacturer by the forging concern. It is usual to specify that the forgings be heat treated and annealed by the forging company before delivery.

After being received by the camshaft manufacturer, the forgings go through the following processes:

Ends centered.
Rough turn.
Rough grind cams.
Pack in carbonizing compound.
Carbonize and cool slowly in pots.
Remove from pots and clean off compound with wire brush.
Heat.
Quench to harden.
Straighten.
Grind bearings.
Grind cams.

This is the simplest process and turns out shafts which are case hardened all over. There is a tendency at the present time to harden only the cam and bearing surfaces or in some cases only the cam surfaces. Particularly is this the case where there are threads or other special machining such as holes or keyways in the shaft which must be held to very close limits. The process then becomes more complicated, about as follows:

Ends centered.
Rough turn parts to be left soft.
Copper plate.
Rough turn cylindrical parts to be hardened.
Rough grind cams.
Pack in fire clay any portions to be kept very soft.
Pack in carbonizing compound.
Carbonize and cool slowly in pots.
Remove from pots and clean off compound.
Heat.
Quench to harden.
Sand blast.
Straighten.
Grind bearings.
Finish other parts, as threads, etc.
Grind cams.

Copper plating from 0.002 in. to 0.005 in. thick and requiring about 20 min. to deposit is used to prevent the penetration of the carbon of the compound into the steel, as this is about the simplest possible way to secure the desired result. Another possible method is to leave about $\frac{1}{16}$ in. extra material on the surface to be left soft and to machine this off after the shaft has been carbonized and before heating and quenching. This method, however, involves straightening the shaft twice and is not used to any great extent except in special cases. A third method used, where only one end of a shaft is to be left soft, is to carbonize all over and exercise special care in the quenching process to dip the shaft only a certain distance, allowing the end which is to remain soft to cool slowly by radiation and conduction to the immersed portion of the shaft.

When only a small number of shafts is to be made, they are usually turned from a bar of the same analysis steel as used in the forgings. This process is slow and expensive, however, and is resorted to only when the quantity is less than 50, in order to save the cost of dies.

### Heat Treatment

The heat treating processes are similar to those employed in case hardening other parts made of low carbon steel, but there are a few points of special interest.

The shafts are packed in individual tubes for carbonizing, the inside diameter of the tube being such that there is at least ½ in. of compound over all parts of the shaft. These tubes are sealed with fire clay and stacked in a furnace where they are heated 6 to 7 hr. at 1,725 deg. to 1,750 deg. Fahr. The tubes are then removed and allowed to cool. The compound, which may be any one of the good carbonizing compounds on the market, is used again and again, the shrinkage being made up with fresh compound.

After the shafts have been carbonized, the carbon content of the surface of the shaft should be 0.90% to

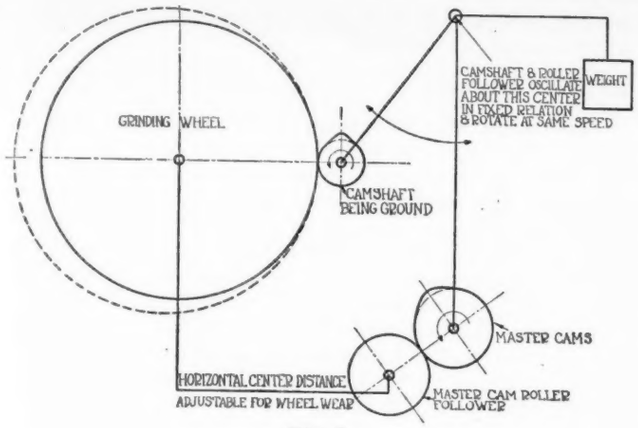

GRINDING WHEEL
CAMSHAFT & ROLLER FOLLOWER OSCILLATE ABOUT THIS CENTER IN FIXED RELATION & ROTATE AT SAME SPEED
WEIGHT
CAMSHAFT BEING GROUND
MASTER CAMS
HORIZONTAL CENTER DISTANCE ADJUSTABLE FOR WHEEL WEAR
MASTER CAM ROLLER FOLLOWER

*Fig. 9*

1.10%. With this carbon content the temperature of the reheating furnace must be 1,400 deg. to 1,480 deg., depending on the temperature of the quenching bath. If the carbon content drops to 0.80% the shafts must be heated slightly higher to secure the necessary hardness.

After cleaning, the shafts are placed in a second furnace, where they are heated about 45 min. at 1,480 deg. Fahr., the temperature being held very closely to this figure and great care being exercised to see that there is a deoxidizing atmosphere in the furnace at all times. If this is not done and an excess of oxygen occurs even for a few minutes, there is usually trouble with the shafts being too soft, due to the decrease of the carbon in the surface of the steel.

After reheating, the shafts are quenched in a bath of salt brine, the temperature of which is held as closely as possible to 65 deg. Fahr. by means of a cooling coil and water circulation. The density of the brine is maintained up to the point where a potato will float in it. If the brine temperature rises much above 65 deg. Fahr. it is necessary to increase the temperature of reheating. In hot summer weather, it is occasionally necessary to shut down the hardening plant entirely as the temperature of the cooling water is not low enough to keep the brine at a point where hard shafts are produced, even with increased reheat temperatures.

The shafts are quenched either endways, each shaft being handled separately in hand tongs and moved around rapidly in the brine after being immersed, or sideways by rolling rapidly down an incline. The brine tank is equipped with a false bottom, the distance of which below the surface is readily adjustable. Thus, when a shaft, one end of which is to be kept soft, is being quenched, the false bottom is set at such a depth that the shaft can be dipped only the proper distance if held vertical with its lower end on the bottom. After being moved around in the brine for about 10 sec., the shaft is set at one side in the tank with the shaft end still red hot and allowed to remain until cool.

Shafts treated as above must show a scleroscope reading of 70 to 80 in general practice, although limits of 80 to 90 are frequently specified and seldom realized. The maximum hardness obtained is about 85 scleroscope. These are the figures required on cam surfaces where the pressure is concentrated on a line. On the bearings, it is usual to permit the hardness to run as low as 55 scleroscope, while in one airplane camshaft the bearings were specifiedto be left soft.

Allowance must be made in machining camshafts for the shrinkage endways of the shaft which takes place on hardening. This amounts to about 1/64 in. per ft. in shafts hardened all over and a little less on shafts left partially soft.

A peculiar trouble that occurs occasionally in shafts copper-plated to prevent hardening is flowing of the copper from the sides of the cams or the body of the shaft on one of the surfaces to be hardened during the carbonizing process. This would, of course, make a soft spot wherever it occurred. No logical explanation of this phenomenon has been offered, as the carbonizing heat is far below the melting point of copper. Fortunately, it is a rare occurrence and a little watchfulness prevents such shafts from being finished.

### Straightening Camshafts

After heat treatment, nearly all camshafts are sprung out of line, some as much as ½ in. This warping may be the result of the carbonizing heat, the hardening heat or the quenching. The shafts are straightened on centers in a special foot power arbor press with quick adjusting means to locate the pressure at any particular point and clamps to resist the bending at points which run true. If the shaft is hard all over it is necessary to apply the pressure and then strike the shaft a sharp blow with a hammer at the point of pressure, in order to make it take a permanent set. In shafts with cams and bearings only hardened, the hammer blow to cause set is not required.

After straightening, no point of the shaft is allowed to run out more than 0.007 in., as this leaves only sufficient stock for the final grinding, the initial grinding allowance usually being 0.010 in. to 0.015 in. on each surface.

### Machine Tools Employed

After being centered the forgings are rough turned on low swing lathes, the center bearing being machined first to provide the seat for a steady rest. The remaining cylindrical surfaces are then machined, using as many cutting tools as possible simultaneously in order to reduce the time required per shaft.

Practice differs in machining the eccentrics specified on some shafts. Some manufacturers offset the shaft and turn or grind the eccentric, while others treat the eccentric as a cam and grind it from a special master cam.

Threads, holes, keyways, etc., are machined on the

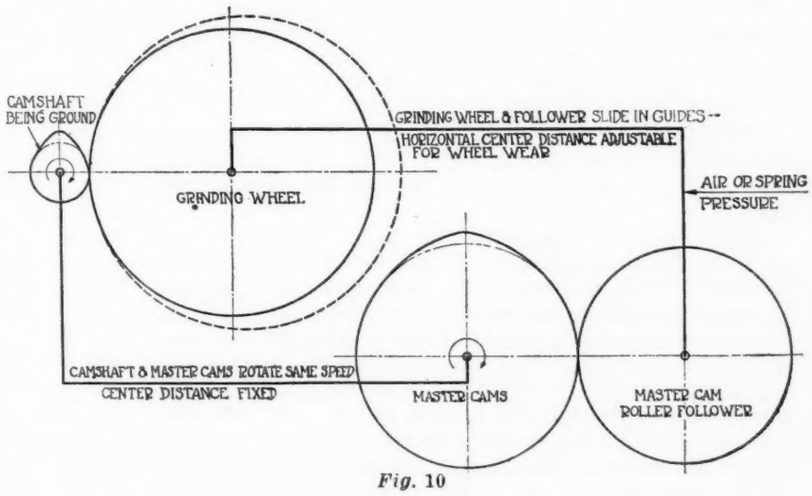

CAMSHAFT BEING GROUND
GRINDING WHEEL & FOLLOWER SLIDE IN GUIDES
HORIZONTAL CENTER DISTANCE ADJUSTABLE FOR WHEEL WEAR
AIR OR SPRING PRESSURE
GRINDING WHEEL
CAMSHAFT & MASTER CAMS ROTATE SAME SPEED
CENTER DISTANCE FIXED
MASTER CAMS
MASTER CAM ROLLER FOLLOWER

*Fig. 10*

usual standard machine tools. Finished cylindrical surfaces concentric with the axis of the shaft, such as bearings, seats for gears, etc., are ground on centers in a plain grinder, all grinding being done wet.

Two types of cam grinding machines are in general use, the principles employed being illustrated in Figs. 9 and 10. The machine represented by Fig. 9 is the older type and employs fixed locations for the master cam roller follower and the grinding wheel, except that the horizontal center distance of the two is, of course, adjustable for size of wheel and wheel wear. The camshaft being ground, the set of master cams—one for each cam on the shaft—are mounted in a rigid carriage which oscillates about a center above both shaft and master cams, the master cam in use at any particular time being held in contact with the master cam roller by means of a lever and weight attached to the carriage. The camshaft and the set of master cams are geared together so that they rotate in the same direction at the same speed. The grinding wheels used with this machine are 18 in. in diameter when new and are used until they are reduced to 14 in. The master cams are made with a 4½ in. base circle diameter and the master cam roller is 4½ in. in diameter, regardless of size and shape of the cams on the shaft. This means, of course, that the shape of the master cam will not be the same as that of the cam being ground, as allowance must be made for the difference in size of the cam and master cam and also of the wheel and master cam roller.

The machine represented by Fig. 10 has the camshaft and set of master cams held in fixed relative position, they being geared together and rotating as for the other machine. The master cam roller and the grinding wheel are mounted on a carriage which slides on horizontal guides, the roller being held in contact with the master cam by a coil spring or about 30 lb. air pressure working on a piston in a cylinder of about 2½ in. bore. The majority of these machines are equipped with 10 in. wheels which are used until worn to 8 in. diameter, but a larger size of these machines is now coming into use in which an 18 in. wheel is used. The master cams are each made from a circular blank 6 in. in diameter, the size of the base circle thus being dependent on the lift of the cam. Rollers of 6 in. and 5 in. diameter are used, the 6 in. roller with a new wheel until its diameter is reduced to 9 in., and the 5 in. roller with wheels from 9 in. to 8 in. diameter.

The master cams in this machine also differ in shape from the cams on the shaft, for the same reasons as given for the machine of Fig. 9.

Both master cams and master cam rollers for both types of machine are made of cast iron and have broad faces, no wear occurring on the working surfaces, although the rollers must be replaced occasionally owing to wear of their bearings.

The older type machine with the swinging carriage is now generally used for roughing only, the finish grinding being done on the machines with the sliding carriage.

An interesting type of spring back micrometer has been developed and patented at one of the camshaft factories. This instrument is used while the cams are being ground, the spring connecting the two anvils being hooked loosely to a supporting rod in front of the camshaft in such a way that the anvils and adjusting and indicating mechanism clear the grinding wheel and the anvils ride on the top and bottom of the cam. This instrument enables the operator to read the body diameter of the cam without stopping the grinding operation, thus saving considerable time. The instrument is accurate within .003 in., which is ample as the allowable variation at this point is ∓.005 in.

### Hollow Camshafts

The use of hollow camshafts has gradually increased on the best engines of certain designs, the hole through the shaft being used as an oil lead furnishing oil under pressure, by means of radial drilled holes in the shaft, to the bearings and even in some cases to each individual cam working surface. The longitudinal holes in these shafts are produced in gun barrel drills in which the shaft being drilled is rotated, the cutting tool being held stationary. The cutting tool is of the one lip type, made of tool steel, and welded onto the end of a piece of special steel tubing. The cross section of this tubing is circular for about 2/3 of the circumference of a circle, and is dented in at an angle of about 90 deg. for the remainder of the section. Oil under pressure is forced through this tubing and out through a small hole in the drill point, the chips being washed back in the groove formed in the tube. The drill point has a length of several times its diameter, while the tubing is slightly smaller, the guiding of the drill thus depending entirely on the point. Ordinarily holes 18 in. deep can be drilled straight within 1/64 in., although occasionally they will run out as much as ⅛ in. Extremely long shafts are frequently drilled from both ends in order to save time, the point where the two holes meet being located under the center bearing to avoid any weak point being formed if the holes do not line up exactly. Usually a rod 1/32 in. smaller in diameter than the nominal size of the hole can be slipped freely through a shaft thus drilled. The cost of this drilling varies with the length of shaft from about 20 to 75 cents per shaft.

The camshafts for the Liberty engine were of this type, having an 11/16 in. hole with only ⅛ in. wall between the cams. Two methods were used in producing these shafts. One maker drilled the hole first, in a solid bar instead of using a forging, then centered the bar on the ends of the hole and proceeded to machine from the solid. Another maker used forgings and drilled from both ends, using a test bar to go through the hole only 1/64 in. smaller than the hole. Both methods proved entirely satisfactory.

### Finish and Limits of Accuracy

The finish on the ground portions of cam shafts varies from the ordinary "commercial" finish to a "mirror" finish, the difference being caused by the rapidity of finishing, the mirror finish, of course, taking more time and accordingly being more expensive. Practically, the "commercial" finish gives entire satisfaction. No chatter marks are allowed in any case, this rule being rigidly enforced.

A peculiar trouble occasionally develops in grinding, so called "wheel cracks" appearing in the ground surface. These cracks are presumably the result of extreme local heating due to the use of too hard a wheel or running the wheel too fast. The remedy is obvious, although a shaft in which such cracks develop must be scrapped, as there is always a chance of the surface flaking off.

Cylindrical surfaces are ground true within 0.0003 in., the usual limits on bearing sizes being +0 and —0.001 in. The elements of the cam surfaces parallel to the center line of the shaft are true both for straightness and parallelism within 0.0005 in. Diameter of base circle has limits ±0.005 in., the surface of the cam proper varying exactly with the radial variation of the base circle, so that the lift has no variation. All longitudinal dimensions have limits of ±1/32 in. from a given point at one end. Variation of base circle radius on any one

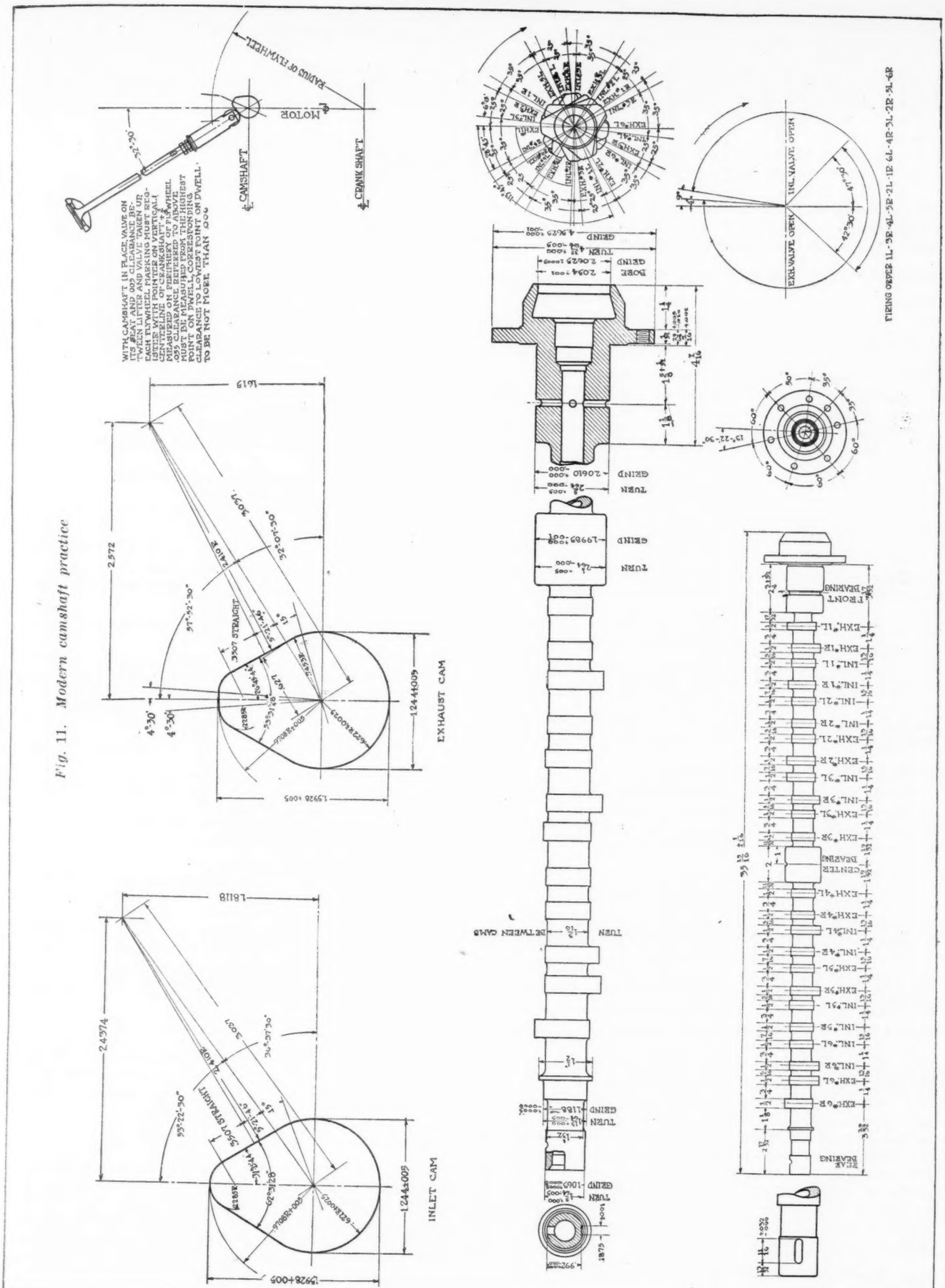
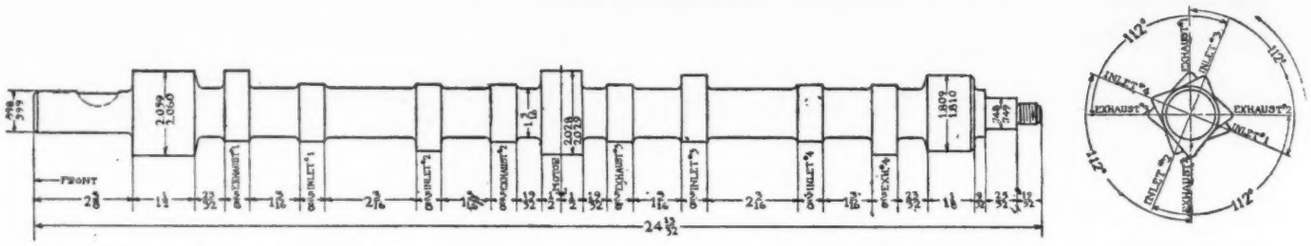



*Fig. 11. Modern camshaft practice*




cam is limited to 0.002 in. maximum, unless one-half of the clearance is less than this figure, in which case the limit is placed at one-half the clearance.

### Effects of Wheel Wear on Cam Shape

The wear of the grinding wheel has no effect on the diameter of base circle and the lift of the cam, but does cause a slight variation in the cam shape, this being a maximum of 0.0015 in. to 0.002 in. in the lift at the point where the flank becomes tangent to the top radius. As the grinding wheel becomes smaller through wear, the sides of the cam become slightly fuller. The variation actually occurring, unless the operator of the finish grinder is careless about changing the master cam roller when the grinding wheel has worn down to 9 in., has practically no effect on the velocity or acceleration of the valve, and consequently can be neglected.

### Sprung Camshafts

Camshafts are occasionally returned to the makers because they are not true, the defect being due either to rough handling in shipment or abuse after arrival at the engine plant. It may be taken for granted that camshafts are practically true when boxed for shipment, as all are given final inspection on this point. Usually a sprung shaft can be straightened quite easily without being returned to the maker. Intelligent co-operation of the chief inspector of the engine plant with the camshaft manufacturer will usually result in preventing trouble of this kind and save money for both parties.

### Effect of Cam Design on Grinding

As far as grinding is concerned, there is no limitation on the design of mushroom and tangential cams, except the general one that cost of grinding increases with cam width, cams over 1 in. wide being objectionable in this respect.

The constant acceleration cam is a bad grinding proposition if the radius of the concave flank is less than 6 in., owing to the smaller diameter wheel which must be used. A grinding wheel cuts most efficiently and satisfactorily at a certain surface speed; thus, the speed of the wheel must be increased as the diameter is reduced, resulting in greater strain and wear on the driving belt. Also, the smaller wheel has less cutting surface and consequently cuts more slowly and wears more rapidly. It must also be trued up more frequently, which again takes more time and decreases the life of the wheel. Surface or wheel cracks also are more apt to develop in this type of cam, owing to the greater arc of contact of the wheel with the hollow flank and the resulting greater time interval during which local heating can take place. As the radius is decreased below 6 in. the cost mounts rapidly, being about double for a 2½ in. radius, which is the ordinary commercial minimum. Smaller radii can be ground if necessary, but the cost is almost prohibitive and it is difficult to get a manufacturer to undertake the work.

### Cam Specifications and Checking

Before a manufacturer can start the production of master cams for a new shaft he should be furnished with the following information:

1—Valve timing—tabulation or flywheel diagram.
2—Clearance to be used with item 1.
3—Type of cam follower—mushroom, curved, or roller.
4—Radius of curved or roller tappet.
5—Cam shape.
6—Lift every one degree at start and end of lift and at least every 5 deg., preferably every 3 deg., through the center section of the lift.
7—Location of clearance inside or outside of base circle.
8—Shape of quieting curve if clearance is inside base circle.

Item 6 is frequently omitted, but should always be given, as the final checking of the cam shape must always be done by measuring the lift at the various angular positions. Furnishing this information in the beginning will establish all the fundamentals and also enable the camshaft maker to check the figures to avoid the discovery of errors after expensive work has been done and valuable time wasted.

The timing is held accurate to the figures specified with limits of ±2 deg. on the point of opening and closing of each valve. The lift at any point with the standard size grinding wheel used to form the cams is held to within 0.001 in. of that specified.

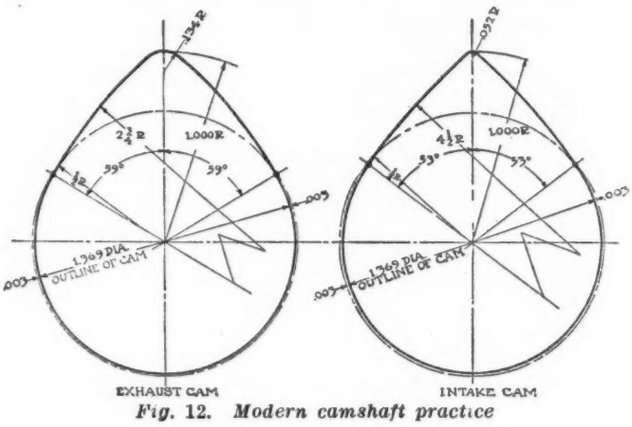



*Fig. 12. Modern camshaft practice*

### Camshaft Practice

Two examples of modern camshaft practice, as shown by the drawings of car manufacturers, are shown in Figs. 11 and 12. Both of these represent excellent practice and are worthy of detail study.

### Conclusion

The writer wishes to express his appreciation of information furnished and assistance rendered by the Hupp Motor Car Corp., the Packard Motor Car Co., the Muskegon Motor Specialties Co. and the L. O. Gordon Mfg. Co. Much valuable data, including the derivation of most of the formulae included in this article, is to be found in volume I of "The Gasoline Automobile," by P. M. Heldt, to which the writer is greatly indebted.

# Miracles Required if British Output Reaches 60,000 Cars

**British makers are having many troubles in their effort to turn to quality production. Chief among these is the attitude of the workers, not only in the automotive plants but in the foundries. Mr. Bourdon presents here an analysis of the situation that is illuminating as to the possibilities for a market for American cars in the United Kingdom**

By W. M. Bourdon

UNLIKE American motor manufacturers, British concerns are, as a rule, very reticent as to their outputs, and only in isolated cases is it possible to obtain definite information on this point. The British motoring public has, however, been told during the last twelve months of numerous firms (mostly newcomers), who were planning outputs ranging up to 10,000 cars per annum; in one or two instances an even larger production has been forecasted by interested parties.

However, few of these promised "mass production" schemes (10,000 cars per annum would constitute a record in Great Britain and would be considered an immense output) have shown signs of maturing. The new Angus Sanderson assembled car was announced as a 6,000 proposition for 1919, but it is doubtful whether up to the moment of writing the number represented by the first two figures has been reached. Agents have had a few demonstration cars, but in the hands of private owners they are few and far between.

Daimler seems to have turned out as many cars as any British firm, though Wolseley probably runs them close, and may have secured a bigger output of their modified pre-war models this year. Before the railway strike Daimler reached nearly 30 touring chassis a week, in addition to their two-ton truck chassis, which would add 10 or 12 to the total.

But British motor firms have been hampered at every turn. Castings, stampings, pressings, steel bar, springs and other raw parts have been received on a minute scale compared with requirements, though labor troubles, which have cropped up one after the other, would have prevented full advantage being taken even if all the material required under the original programs had been available.

In regard to material, at the time of writing one of the biggest firms is "living from hand to mouth." In another case engines and transmission sets lie around owing to lack of frames. At a third plant, not one chassis of the most popular model, of which the normal output should be 12 a week, issued during September and the first half of October, and only two in August, simply because no delivery of rear axle castings could be obtained. And so the story goes.

## LABOR

As for labor, the demands in some cases have been out of all reason and failing their acceptance by the masters, the men enter strike or "go slow," that is, they do just as little as they can without actually stopping; if one is reproved or discharged the whole lot go on strike. No overtime is allowed by the union officials under any conditions.

This sort of thing has been going on in every branch of the engineering and motor industries. Is it surprising, therefore, that anticipated outputs of even pre-war designs have not matured? Yet all the while the public has been clamoring for cars, offering 50, 70 and even 100 per cent premium on catalogue prices.

Coming back to figures, it is probable that not more than 2,000 or at most 3,000 new British cars have been supplied to the public since the signing of the Armistice, and yet it has been computed that Great Britain is short by 200,000.

Any statement as to the possible output of cars from British plants during 1920 must be founded upon what firms are planning to do, anticipating with considerable optimism that labor, material supplies, and their own internal organization will not prove stumbling blocks, to say nothing concerning designs requiring modification.

## EXPECTED OUTPUT

Even assuming that plans do not go awry, it is unlikely that more than 60,000 cars will be made in Great Britain during 1920, and these will represent the total output of about 50 firms making cars that sell at prices ranging from $1,000 to $10,000. But that plans will go wrong in many cases can be taken for granted, even if Wolseley turns out 10,000 cars next year, Daimler 4,000, Austin, Angus-Sanderson, Bean, Ruston-Hornsby and Cubitt 6,000 each, Siddeley (now Armstrong-Siddeley) 5,000 and seven other firms 1,000 apiece, it is highly improbable that—ignoring the Ford assembling plant near Manchester—the remainder will turn out 10,000 more.

But some of the firms named will certainly have to work miracles to reach the output set against them above. From personal inspection, the writer can say that two in the 6,000 class show no signs yet in their plants of an output reaching even the 600 per annum rate, despite their optimistic plans and promises.

It must be remembered that a new firm entering the motor industry must, failing imported parts, put down plant and make jigs and tools for practically every component except engines. The latter can be bought from two or three firms of engine specialists, but even these have limited capacities, and their production bears no proportions to that obtaining in the U. S. A. Axles, gear sets, and steering must all be made by the car manufacturer, for the one firm that counts in these matters—Wrigley & Co., Birmingham—has its hands practically full catering for Angus-Sanderson.

When it is known, therefore, that some of the "quantity production" cars of new firms have hardly yet been tested out, and that jigs and tools have still to be made by machine tools and in shops that are not yet in existence, it will not cause surprise if the estimated outputs for 1920 are looked upon as unduly optimistic.

# Getting Aquainted Abroad Through Films

**This article should not be construed in any sense as a recommendation for the motion pictures as an advertising medium. Mr. Levey may or may not be right in his conclusions, but the idea in presenting this subject is to place before the manufacturer the facts as they are known to this man who views this movement from the inside. The manufacturer must decide for himself whether or not this form of advertising fits his case**

By Harry Levey

WEAPONS are just as important in this "war after the war" as in the one just finished.

The motion picture medium of industrial advertising is one of the principal weapons now being used by two of America's strongest rivals, England and Japan, in the fight for the South American trade. It will be one of Germany's sharpest weapons in her struggle to "come back."

To let you know what American industry is failing to do in this connection, I will cite the cold figures furnished me by Dr. Francis Holley, director of the Bureau of Commercial Economics, Washington, which circulates educational films in South America. The bureau is an altruistic association with which the United States government and the principal foreign governments are cooperating. It is organized under the General Educational Act, has no common stock and makes no profit on its films. It has the largest educational film library in the world, from which it loans motion pictures without charge to schools, employers, churches, organizations, etc. In addition to loaning films, it exhibits its own pictures in many different lands.

**Now if an American manufacturer has a film—of the required standard—made of his plant, the bureau will circulate it in other parts of this country and in foreign countries. Such films have great educational value because they show one half of the world how the other half works and they show how commodities are made. The bureau, being international in its scope, will accept a motion picture from a Japanese or English manufacturer just as quickly as from an American concern, provided the film comes up to the bureau's standard.**

**Well, the bureau today, according to Dr. Holley, is sending motion pictures of foreign industries to South America at the rate of 250,000 ft. of film a month. Of this, England is sending the lion's share, Japan next.**

**Only 65,000 ft. of film portraying America's industries are being sent by the bureau to South America, in a month.**

The only reason for this 250,000 to 65,000 score is because the manufacturers of the United States have no more industrial pictures to offer the bureau—that is all they are having made.

## ENGLAND AND JAPAN

Of course, England and Japan get the greatest circulation of their films in South America through the distributing exchanges of the regular film concerns. The industrial films circulated by the bureau are only a small part of the whole in South America the same as in this country. I have no way of knowing the circulation figures of the various South American exchange concerns. But it is reasonable to suppose that the proportion of American and foreign industrial film disclosed by the bureau's figures would hold good in respect to the circulation through regular exchanges.

These bureau figures reveal a condition which warrants serious thought on the part of every American business man.

In the war's darkest hour, even when England was supposed to be exerting the last ounce of her strength toward whipping the Germans, she found time to make 1,500,000 ft. of industrial motion pictures, to have ready for use when world trade opened again. That shows what English merchants think of screen advertising as a means of getting trade. English merchants realized long since that when a man starts "reading" a motion picture advertisement his mind is in a receptive condition. He is sitting at ease in a comfortable theater chair.

## INFLUENCE OF THE THEATER

In the silence of the theater there is nothing to distract his mind from the point that is being driven home on the screen. For sixteen minutes, if the industrial picture is a one-reeler, the message of the foreign merchant has the undivided attention of the South American audience. During that period the audience below the equator can, through the celluloid distance annihilator, take a trip through a factory thousands of miles away. Language at its best only creates mental images, Motion picture advertisement is all images. A manufacturer might send a fleet of ships loaded with literature to South America and not create the impression of the natives that 1,000 ft. of film would.

**The motion picture method of industrial exploitation is peculiarly fitted for South American purposes. The average South American likes to do business with his friends. Many an American business man remembers how he fared when, in the days before the war, he tried to cut in on some of the trade monopolized by the Germans. Americans found that even if they offered better goods at a lower price, the Germans, on the whole, still got the orders. This was because the sons of the vaterland were there first and had already established ties of acquaintanceship, if not friendship.**

South Americans are now more ready to make friends with us Yankees than at any other time in history. They are waiting down there for us up here to go out half of the way.

Next to doing it personally, there is no better way for American business men to get acquainted with their South American cousins than through the medium of motion pictures.

It would be great if an American business man could take a few years off and make the rounds in South America. He surely would rake in the orders if he could pack up his plants, put it on a boat, set it up again below the equator

and invite the Latin American merchants in to see it. Since these things would be somewhat impractical, he can, however, do the next best thing.

He can have motion pictures made of himself in the executive office. He can have films made of every process in his plant—from the arrival of the raw material at the factory door to the final packing and addressing to "Somewhere in South America."

The leading men in American industry have "been in" when a motion picture camera man called. While many of the films which they posed have by this time reached South America, they were originally intended for the exploitation of a product in this country only. These business men recognized the personal value among folk here at home. In South America this personal value is raised to the Nth degree.

Let's suppose that a big merchant of, say, Rio de Janeiro has been taken to the picture show by his wife. One of the films is an American industrial picture. Some time later, perhaps the next day, when an American salesman calls, the merchant knows all about the plant. He has—via the Celluloid Rapid Transit—been in the private office of the American concern's president, and feels that he sort of knows him. The merchant knows that thousands of other Brazilians made a trip through the plant the same as he did, and saw the quality of workmanship and material that goes into the concern's products. When the salesman walks out he has the orders.

Will it really work out as pictured above? It has worked out that way in this country for a large number of leading national advertisers. And it is working out that way right now in South America for the comparatively few American concerns and the greater number of foreign industries.

Let me give you an example of how it is now working out for one American concern. A correspondence school had the Universal Industrial Department make a six-reel feature picture. This film contained a story so interesting that at the theater where it was first shown it was featured above a picture with Billie Burke. The correspondence school's advertisement was incidental to the story. The next effective industrial pictures are those in which love, romance or adventure are so woven about the advertising that the average theater patron, while impressed by the merits of the product exploited, enjoyed, too, the real entertainment value.

The school gave the Universal exchange the dates it wanted the picture shown in certain towns and the theaters it preferred. The salesman arrived in a city at the same time the film did. The results were such that another national advertiser has made screen advertising a permanent and vital part of its exploitation campaigns.

The theatres of South America are prosperous and popular, and offer fertile field for exploitation of Ameriacn industries.

The motion picture, as President Wilson says, is the "Universal Language." It is understood in all lands, by the educated and illiterate alike. The story of American industry can best be told to South America in this universal tongue.

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# The Utility of Airships and Planes

IN his presidential address before the British Association for the Advancement of Science, Sir Charles A. Parsons made some observations on the comparative utility of airplanes and airships for commercial purposes. In the case of airplanes the weight per h.p. increases with the size, other things being equal. This increase, however, is met to some extent by a multiplicity of engines, but in the fuselage the increase remains. On the other hand, with the airships the advantage increases with the size, as in all ships. The tractive effort per ton of displacement diminishes in inverse proportion to the dimensions, other things, including the speed, being the same. Thus an airship of 750 ft. length and 60 tons displacement may require a tractive effort of 5 per cent, or 3 tons at 6 miles per hr., and one of 1,500 ft. in length and $6 \times 60 = 480$ tons displacement, would only require $2\frac{1}{2}$ per cent $\times$ 480 = 12 tons at the same speed, and would carry fuel for twice the distance. With the same proportion of weight of haul to displacement, the larger airship would stand double the wind pressure and would weather storms of greater violence and hailstones of greater size. It would be more durable, the proportional upkeep would be less, and the proportional loss of gas considerably less. In other words, it would lose a less proportion of its buoyancy per day. It is a development in which success depends upon the project being well thought out and the job being thoroughly well done. The equipment of the airsheds with numerous electric haul winches and all other appliances to make egress and ingress to the shed safe from danger and accident, must be ample and efficient.

The airship appears to have a great future for special commerce where time is a dominant factor and the demand is sufficient to justify a large airship. It has also a great field in the opening of new countries where other means of communications are difficult. The only limitations to size will be the cost of the airship and airsheds. Just as in speed vessels, it is the cost of the vessel and the cost of maintaining the harbors that limit the size of Atlantic Liners.

Such developments generally take place slowly, otherwise failures occur—as in the case of the Great Eastern—and it may be many years before the airship may be increased from the present maximum of 750 ft. to 1,500 ft. with success, but it will assuredly come. If, however, the development is subsidized or assisted by Government, incidental failures may be faced with equanimity and very rapid development accomplished. In peace times the seaplane, airplane and airships will most certainly have their uses. But except for special services of high utility, it is questionable whether they will play more than a minor part as compared with the steamship, railway and motor transports.

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## Oil Viscosity

THE problem often arises of how to get a mixture or blend of definite viscosity from two oils of known viscosities. To avoid the labor which necessarily accompanies "cut and dry" methods, it is desirable to have tables or diagrams for obtaining the viscosity of a blend of two oils in any proportions. Such a diagram has been constructed and agrees well both with formulae and experiments, and it has viscosities expressed in seconds as determined by the Saybolt viscosimeter. It is believed that previous blending charts have been expressed either in units which are inconvenient for the American oil refiner, or are not based upon formulae, and are, therefore, not readily extended beyond the range of experiments.

# The FORUM

## Farm Lighting Battery Rating

Editor AUTOMOTIVE INDUSTRIES:

Referring to the question of battery rating for farm lighting plants, there is very little to add to my remarks at the time of the summer Standards Committee meeting. There is, of course, no reason why storage batteries cannot be rated on the basis of any time period desired, provided there is an accompanying understanding of what such rating implies. A 3-hour rating means just as much to the battery engineer as an 8-hour rating because he knows that it is just twice as much in amperes. That is to say, a battery which gives 50 amperes for 3 hours will give 25 amperes for 8 hours. The buying public, however, would find much difficulty in following these changes in capacity and could be easily misled by the confusion due to a sketchy knowledge of the subject.

Perhaps the best reason for continuing the old 8-hour rating is that most people understand its significance and are familiar with the size battery which any given 8-hour rating would indicate. Another reason is that beyond 8-hour total capacity of the battery does not increase in any such ratio as it does between one and eight. It is probable that the new S. A. E. rating will lead people to think they are obtaining more actual capacity than is the case.

I confess, however, that it is wise to keep the mind open on this subject, for it may well be that the new rating is better than the old.

W. H. CONANT,
President, The Prismolite Co.

## Horsepower Rating

Editor AUTOMOTIVE INDUSTRIES:

I have read Ralph C. Chestnutt's statements regarding the incorrectness of using piston speed in connection with horsepower rating formulae, which appeared in the forum of the Oct. 9 issue of Automotive Industries, and wish to say that I heartily agree with him. I brought out this same point in my article entitled "Practical Engine Rating," which appeared in the Oct. 26, 1916, issue of Automotive Industries in which I said in part:

"Let it be assumed temporarily that all engines have the same volumetric and thermal efficiency. Then maximum power will be obtained at the same number of revolutions per minute in all cases, no matter what the stroke-bore ratio or piston displacement of the engine may be. Under the same conditions, however, the piston speed at maximum power will not be the same for two reasons:

"1. Because in engines of the same piston displacement the piston speed will vary with the stroke-bore ratio.

"2. Because even if all engines had the same stroke-bore ratio the piston speed would vary with the displacement, or in other words with the size of the engine in each case.

"Of course, actually, the thermal efficiency and volumetric efficiency will vary considerably with the design of the engine and this will cause some variation in the revolutions per minute at maximum power, and a further variation in the piston speed. However, since but two factors affect the revolutions per minute while four affect the piston speed, it is obvious that the speed of revolutions and not the linear piston speed should be considered in developing a horsepower formula."

EDWARD G. INGRAM.

## A Discussion of the Olympia Show

Editor AUTOMOTIVE INDUSTRIES:

The congested state of Olympia during the show—crowded with visitors aggregating about double the attendance at the last pre-war show of 1913, and little less crowded with car exhibits listed at high prices—has prompted the "Times" in a special article to discuss the war effects on motor insurance.

The subject is worth noting by Americans interested in British trade, from these two angles (1) the indispensability of insuring motor cars, and (2) the necessity of improving their reliability in so far as it has a bearing on accident risks. As regards the latter point I believe it is correct to hold that American cars—and this observation applies to those cars here which are mainly in the category of the Overland, omitting the Ford—are comparatively immune from accidents of the sort covered by insurance policies, and as some proof of the statement I understand from medical friends that the insurance rates on the American cars are lower than on European cars of corresponding power rating. At all events the British Medical Association, which is a sort of Doctors' Trade Union, has lower rates on certain popular priced American cars.

In passing it may be noted that the private car owner can insure against the following risks, whole or in part:

(1). Loss or damage to a car and all its accessories, including fire and theft.

(2). Unlimited liability to the public for personal injury or damage to their property, including any litigation expenses which may be incurred.

(3). Compensation for personal injury to the owner of the car; and payment of the medical expenses for all the occupants.

(4). Costs incurred in the defense of police court proceedings or in representation at a coroner's inquest.

The chassis items most concerned with accident risk are the steering gear and the brakes, and the comparative immunity of American cars from breakdown or accident resulting therefrom on both scores, probably is the factor most accounting for any preference in insurance rates. There is a further factor that American car spares are much cheaper and more quickly available than most European car parts. It may be added that

some of the insurance companies here are granting abatements off standard rates on cars fitted with a wind screen fitted with patent "safety" glass, which is constructed of two layers of glass with a sheet of celluloid interposed.

The yearly insurance premiums range from about $25 for a small car to $180 for an expensive car, but it is likely that these rates will be increased to cover the rise in materials (about 250%) and labor 110%. Whether the quality and dependability as well as the price of car material has advanced to the stage of making British cars more immune from breakdown remains to be tested, but report has it that on the whole material is now less uniform in quality than before the war.

## Horsepower Rating Formula

Editor "Automotive Industries":

I have read with interest the letter of R. C. Chesnutt in Automotive Industries of Oct. 9, proposing a new horsepower rating to replace the N. A. C. C. rating H. P.$=\frac{B^2N}{2.5}$. The latter rating was inherited from the old Association of Licensed Automobile Manufacturers which had merely taken it over more than a dozen years ago from the British Royal Automobile Club.

There is no doubt whatever that the $\frac{B^2N}{2.5}$ rating is entirely antiquated and should be discarded in favor of a rating having some relation to the power developed by the modern automobile engine. As the purpose of a rating such as that of the N. A. C. C., however, is to give an easy and rapid means of calculating the horsepower of different engines with a moderate degree of accuracy the introduction of such symbols as $\pi$ is to be deprecated. I disagree, therefore, with Mr. Chesnutt when he proposes to replace the $\frac{B^2N}{2.5}$ rating (which at least possesses the merit of simplicity) with the expression

$$\text{H. P.}=\frac{3.146\ B^2SN}{40}$$

It is certainly true that knowing the piston displacement of an engine is of value in arriving at an exact determination of the horsepower. To be consistent, however, the revolutions per minute of the particular engine in question should be taken into account and not merely assumed to be 1000. Doing this would further complicate a formula already too complex for rapid use without a slide rule.

To replace the obsolescent N. A. C. C. rating, I submit the following:

$$\text{H. P.}=\frac{B^2SN}{12}\text{ in which}$$

B=Bore (in inches),
S=Stroke, and
N=Number of cylinders.

This rating has been developed from the well-known steam horsepower formula $\frac{PLAN}{33000}$. Its simplicity is enhanced by the fact that the constant 12 is readily divisible by the number of cylinders employed. For four cylinders, therefore, the rating becomes merely $\frac{B^2S}{3}$ for six cylinders $\frac{B^2S}{2}$ and for twelve cylinders $B^2S$.

While this rating approaches the limit of simplicity, accuracy is not sacrificed. On the contrary, I shall show that it is considerably more accurate than the formula H. P.$=\frac{3.1416\ B^2SN}{40}$

In Table II of Mr. Chesnutt's letter a comparison is given between the actual brake horsepowers of a number of engines tested at 1,000 revolutions per minute and the horsepowers of the same engines calculated by his formula. In all cases the cylinder bores are omitted and in some cases the strokes as well. By referring, however, to Table I which compares the N. A. C. C. and Chesnutt ratings for a large number of engines (apparently all four cylinder, although this is nowhere stated) I have been able to identify the cylinder sizes of certain of the engines tested. A list of these is given herewith together with the actual B. H. P. by test, the calculated H. P. by Mr. Chesnutt's rating, the calculated H. P. by the rating I propose and the error in each rating.

It will be seen that the average error (0.87 H. P.) in the $\frac{B^2SN}{12}$ rating is barely more than one-half the average error (1.63 H. P.) in the considerably more complicated rating suggested by Mr. Chesnutt. If the sign of the error be taken into account, the superiority of the $\frac{B^2SN}{12}$ rating becomes still more manifest as its total error for the eight engines becomes by addition only —0.2 H. P., whereas due to the fact that the $\frac{\pi B^2SN}{40}$ formula consistently underrates the power of all the engines on the list, its total error is —13.1 H. P.

In the rating here proposed, I have assumed the number of revolutions per minute to be 1000. If it is desired, however, to find the horsepower of an engine at any given number of revolutions the rating merely becomes:

$$\text{H. P.}=\frac{B^2SNR}{12000}$$ in which R = number of revolutions per minute.

JOHN JAY IDE,
Lieut. (j.g.) USNRF.

COMPARATIVE TABLE OF HORSE-POWER OF VARIOUS FOUR-CYLINDER ENGINES BY TEST AND FORMULA.

| Bore & Stroke (inches) | B. H. P. (by test) | H. P. $=\frac{B^2SN}{40}$ | Error H. P. | H. P. $=\frac{B^2SN}{12}$ | Error H. P. |
|---|---|---|---|---|---|
| 3½x4 | 17.0 | 15.4 | —1.6 | 16.3 | —0.7 |
| 3¾x5 | 24.0 | 22.1 | —1.9 | 23.4 | —0.6 |
| 4 x5 | 27.0 | 25.1 | —1.9 | 26.6 | —0.4 |
| 4 x5½ | 28.5 | 27.7 | —0.8 | 29.3 | +0.8 |
| 4 x6 | 33.0 | 30.2 | —2.8 | 32.0 | —1.0 |
| 4¼x5½ | 33.0 | 31.2 | —1.8 | 32.1 | —0.9 |
| 4½x6 | 39.0 | 38.2 | —0.8 | 40.5 | +1.5 |
| 4¾x6 | 44.0 | 42.5 | —1.5 | 45.1 | +1.1 |

# Employer's Responsibility to Workers

**Again departing from his usual custom, Mr. Tipper this week calls your attention to a concrete example of progress toward better industrial relations. Last week he discussed the success of this work in the Bullard plant. This week it is the recognition of this plan, in a general way, by the New York merchants, one of the largest local bodies of business men in the country. This indicates that the personal practice has reached a point where it is becoming organization practice**

By Harry Tipper

SOME time ago the Merchant's Association of New York, which is one of the largest local bodies of business men in the country, appointed an Industrial Committee and a sub-committee of that general industrial committee to deal with the subject of industrial relations. The Industrial Committee has finally presented its report to the Merchant's Association, and that report is sufficiently indicative to merit liberal quotation from it in this article.

The report itself does not offer anything new, but it emphasizes some points which have been brought out in these articles and, by that emphasis, places an official recognition upon them by a large body of business men.

We have indicated from time to time, that individual practice is always far ahead of the endorsement of such practice by the general body at interest, or any considerable sections of it. When the individual practice is endorsed by any organization representing a considerable section, it is evident that the necessity for an extension of that practice has become apparent.

**In a preliminary part of the report, is noted the statement that employers must take the lead in the effort to apply sound principles. This statement is obvious, but its significance is not yet appreciated properly by manufacturers. It is a part of the responsibility of management to think ahead far enough to determine the sound principles that are necessary, and to begin the application of those principles in the practical operations.**

In no other way will the advance be made, so that there will be no necessity of retracing our steps from time to time. The difficulties which are in the way, in view of this Committee, deal with lack of understanding and mutual confidence which has been a portion of a considerable part of the discussion in AUTOMOTIVE INDUSTRIES. It appears that the report would have been more logical if this lack of understanding had been placed first, because the short-sightedness which is mentioned as the first difficulty, is the direct result of ignorance in respect of human necessities and habits of though. **Ignorance can never be just,** because justice presupposes an understanding of the necessities, and therefore, a determination to fulfill these necessities, as far as possible, is the practical operation.

The recommendations of the Committee cover also the points which have been discussed in these articles, and there is no need to emphasize them further with the exception that the Committee in the last part of its report, as quoted here, admits that all workers are entitled in return for a fair day's work to a living wage, sufficient to insure the workers and their families, the opportunity to live in health and comfort.

Of course these terms are too indefinite to be of much practical value except as they can be interpreted wisely by the understanding of the individual employer. The acceptance of this principle by this Committee, however, marks an advance in the discussion of the matter which it is interesting to note. Here are the quotations.

Employers must take the lead in the effort to apply sound principles to the improvement and advancement of industrial relations; much in the way of leadership is properly expected of them.

This evolution is being retarded in part by three features of our industrial system, which are not compatible with satisfactory industrial relations:

**1. The short-sighted determination too often found on the part of employers and employees selfishly to get maximum results without consideration by either of the interests of the other, or of the public, as the controlling motive in industry.**

This selfish determination of employers and employees has hitherto been recognized by society as entirely proper, yet it is fallacious because it is destructive of maximum production.

**2. Lack of understanding and mutual confidence of employers and employees.**

Suspicion and lack of a complete understanding of each element in industry of the just aims, aspirations and problems of all other elements make constructive cooperation impossible.

**3. The law of supply and demand as the determining factor in fixing wages and conditions of employment.**

Many of the results of this economic law are unfair and prejudicial to the interests of both employers and employees, and are socially undesirable.

In view of the detrimental influence of these three features of our industrial system, your committee recommends:

**1. The recognition by both employers and employees that the determination to achieve national prosperity rather than to enforce maximum selfish returns should be the controlling motive in industry.**

The community, as such, has a right to insist that industry be carried on in the interest of all citizens rather than for the sole benefit of those engaged directly in it. The permanent welfare of all citizens depends on national prosperity, which is impossible unless there is maximum production at minimum "per unit" cost without impair-

ment either of proper living standards of employees or the ability of the employers to earn a reasonable return on their investment. These requisites of national prosperity cannot be obtained unless employers and employees work together harmoniously with that end in view. Fundamental industrial problems of human relations can be solved upon the accepted basis that without national prosperity the permanent interests of parties to industry cannot be conserved; and that with such prosperity relations between employers and employees can be worked out with justice to both.

In its broadest aspect, employers and employees unquestionably have a common interest, as it is only through the promotion of the interests of both that the country and in the industrial communities in it can enjoy permanent prosperity. The actions and demands of employers and employees become unwarranted when they handicap the industries of the nation in competition with foreign industries.

**2. The establishment of a recognized and permanent method of conference between the employer and his employees.**

Conferences, at which all subjects of mutual interest may be presented, are essential to the development of understanding and mutual confidence. The mere willingness of an employer to meet employees who have grievances is not sufficient. There should be a definite arrangement—satisfactory to both employers and employees—whereby employees can collectively take up disputes or matter of common interest with employers.

Your Committee has no recommendation to make concerning the plan of conferences which should be established, except that whenever plans of conferences are inaugurated they should be worked out jointly by employer and employees, and not prescribed by the employer. Conditions vary so in different industries and plants that no one plan of conference can be adopted by all. The plan must be developed and adapted in each plant in the light of existing conditions.

The functions of the conference and the determination of the proper subjects for consideration must be in each case a matter of gradual development. Your Committee suggests, however, that the following matters should be immediately recognized as included in those which should be discussed in conference:

(a) Wages and working conditions including steps to promote continuous and permanent employment, especially in the case of introduction of new machinery and new processes.

(b) Plant conditions affecting health and general welfare of the workers.

**3. The limitation of the economic law of supply and demand as a basis of labor policy by the utilization of a more human doctrine.**

Like the solution of the entire problem of industrial relations, the development of any definite human doctrine, which will modify and limit the economic law of supply and demand, will be a matter of evolution. Nevertheless, your Committee recommends the immediate recognition of the following principles which will themselves modify the application of the law of supply and demand to a large degree, and are essential to the development of the human doctrine.

1.—All wage earners, skilled and unskilled, in return for a fair day's work, have a right to a living wage sufficient to insure the workers and their families the opportunity to live in health and comfort in accord with the concepts and standards of American life.

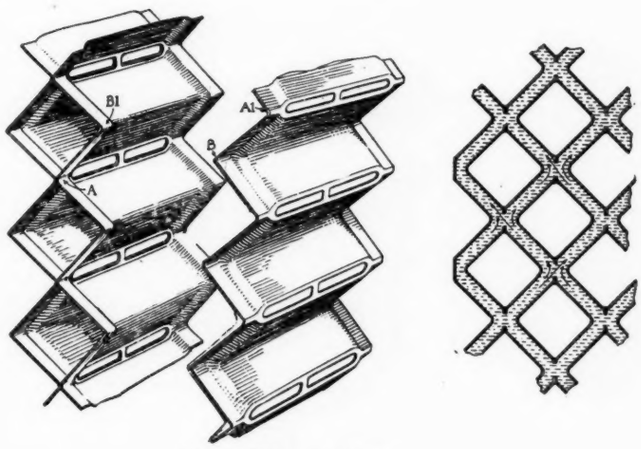
2.—Continuity of employment at normal wages should be maintained up to a point where permanent prosperity and stability of the business—rather than immediate profits—would be endangered thereby.

## The New Wilder Radiator

A NEW type of radiator core construction embodying a true cellular formation with the ease of manufacture of the tubular and finned tube variety has been brought out by T. M. Wilder, of the Motor Age editorial staff. The point is frequently made that many of the so-called cellular types of radiators on the market are not cellular at all, but in reality tubular, the tubes being bent in various ways or having connecting fins to give an external cellular appearance.

The true cellular construction of the Wilder radiator is shown in the sectional view. It will be seen that every surface is a direct cooling surface; that is, there is water on one side and air on the other, with circulation free in every direction. A stoppage is practically impossible and should any of the passages become stopped up only the immediate area would be affected, as the water would continue to circulate around it.

The simplicity of the sheet metal unit is shown in one of the illustrations, while to the left two of these units are shown perforated and soldered or welded together on the projecting flat faces. In assembling the radiator these sections are cut off to the right length with the projections of one fitting into the indentations of the next and so on, until the whole core is complete. It will be seen that when the projections B and B1 are placed in the indentations A and A1, there will be a space left between the two, formed by the flanged edges.




*The Wilder Radiator.*

This is the water space and it is not only continuous from top to bottom, but in communication laterally with every other such space through the perforations.

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PRESIDENT Wilson has signed the executive order establishing a new schedule for customs duties based on reduced values of foreign currencies. Under the new schedule, customs duties on imports will be based on actual American exchange value instead of on value of currencies in foreign countries.

AUTOMOTIVE INDUSTRIES
THE AUTOMOBILE

PUBLISHED WEEKLY
Copyright 1919 by The Class Journal Co.

Vol. XLI. Thursday, December 4, 1919 No. 23

THE CLASS JOURNAL COMPANY
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SUBSCRIPTION RATES

United States and Mexico ..... One Year, $3.00
Extra postage west of the Mississippi River on account of Zone Postage Law ..... $0.50
Canada ..... One Year, 50.00
Foreign Countries ..... One Year, 6.00
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To Subscribers—Do not send money by ordinary mail. Remit by Draft, Post-Office or Express Money Order or Register your letter. Make Checks payable to Automotive Industries.

Owned by United Publishers Corporation, Address 239 West 39th St., New York; H. M. Swetland, President; Charles G. Phillips, Vice-President; W. H. Taylor, Treasurer; A. C. Pearson, Secretary.

Entered as second-class matter Jan. 2, 1903, at the post-office at New York, New York, under the Act of March 3, 1879.

Member of Associated Business Papers, Inc.

Member of the Audit Bureau of Circulations.

Automotive Industries—The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907, and The Horseless Age (semi-monthly), May, 1918.

## You Never Can Tell

WHEN the coal strike loomed near, automotive manufacturers looked at their coal piles, then inquired of the parts makers and concluded that they could stand the strain very well. We venture that not a single builder of a complete vehicle ever thought of looking at the coal supply of the glass plants. Yet here came the first definite stoppage.

It requires times of stress to point out the weak points.

## A Fly in the Tractor Ointment?

RECENTLY a western tractor man said to AUTOMOTIVE INDUSTRIES:

"The big fault of the tractor business in the West today is the number of makes on the market. This enables too many dealers to sell one tractor this year and another next year. The result is that the tractors they sold last year are orphans.

"One reason for this condition is that there are so many tractor factories looking for sales outlets. The next is that there are too many 'scalpers' being taken on as dealers by the newcomers in the factory field. I mean by a 'scalper' the man who goes into the business to sell a few tractors a year and who is content with the sales profit for the year. He does not care what tractor he sells, he only cares if he sells a few.

"There are two remedies. One is to have fewer and more reliable tractor manufacturers. The other is for tractor makers to be more careful in the selection of selling agents."

Undoubtedly this man knows what he is talking about. He knows how much of a detriment a useless tractor can be. Every farmer in the entire community will point to the useless tractor when approached by a tractor salesman. The strange feature is that these "scalpers" can keep on doing business from year to year. It is admitted that they are not building a reputation wisely or well, but the unfortunate thing is that they are hurting the tractor while hurting themselves.

## Small Displacement Cars in Europe

ONE of the objections to American cars in many European countries is that they have too large engines, or engines with too great a cylinder bore. Even the Ford car, which we in this country consider about the smallest size which a car can be and still be of real utility, is regarded in certain countries as greatly over-engined. The reason why engines of exceedingly small displacement are wanted is two-fold. In the first place, the taxes levied on automobiles in most countries depend directly either on the cylinder bore or on the piston displacement, and in European countries these taxes bear a much greater proportion to the total operating cost of the vehicle than they do here. Secondly, an engine with relatively large piston displacement is always an uneconomical engine so far as fuel consumption is concerned, because if mounted in a light chassis it will run normally under very small load, the compression will be light and consequently the fuel efficiency will be low.

Now, motor fuel is still exceedingly expensive in Europe, except possibly in such countries as Roumania, Galicia and Southern Russia, which produce large quantities of petroleum fuel themselves. Therefore, it is most important to the average European car owner that his engine operate as much as possible at or near its most economical load and speed, which means that a small displacement motor must be fitted. Such a motor will at the same time reduce the tax burden.

In a country like France, where it is practically never necessary to leave paved or macadamized roads, excellent service can be obtained from a two seater with not over 100 cu. in. piston displacement, especially if fitted with a 4-speed gearset. The Baby Peugeot, with a four cylinder engine of only 2.16 in. bore and 3.54 in. stroke, is a good example of a small car designed for fuel economy and low tax rating. At the recent Paris show no less than twenty-two different car models were exhibited with a piston displacement of less than 100 cu. in., and the indications are that there will be a large field for vehicles of this class.

# New Laws for Motor Cars

IT is certainly encouraging to learn that the national manufacturing and dealer associations of the automotive field have joined their forces in the formation of a bureau that will endeavor to advance the passage of wise and just laws on behalf of the industry.

It also is gratifying that one of the first rules made for this bureau is that it is not to seek any publicity for itself and its relation to the industry is to be maintained through associations. Hence this bureau will never be posing before the public for self glory, which usually in this work serves only to draw criticism.

There is much to be considered in connection with legislation for the industry. It is amazing, for instance, that an industry could grow to such size as that attained by the automotive industry before a national law has been made for its benefit. This is recalled by the recent passage of the bill forbidding, under heavy penalties, the interstate traffic in stolen vehicles. There had been a great need of such a law for years, but nothing was done until the recent extra session of congress, when the National Automobile Dealers' Association took the initiative and gained the assistance of other associations and put this bill through.

The primary work for this new bureau is plainly seen in the tables of automobile vehicle registrations as they come from the various states. Such a tangle of statistics is a shame to the several states and to the industry. There should be urged at once, upon all states, a uniform registration measure that will meet the requirements of the roadbuilding program, the industry and, most of all, the needs of the vehicle owner. It is a crying shame that the owner of an industrial truck in a city, that has as its field for usefulness two or more states, should be required to comply with the whims of the legislators of the several states and the whims of the aldermen of the several towns.

And right here is a big item. Automotive legislation has never been given the respect that it should command. Legislators, municipal, state and national, have been inclined to think of an automotive bill as a joke and to let some motor-hating rube write into the bill some whim of his own. An industry that pours as much money into the treasuries as that which builds automotive vehicles should be treated with respect at all times.

But there are certain indications of a new form of legislative work ahead.

One item, which is not new, is the tendency in certain states to tax the heavy truck out of existence. This is well illustrated in the tax of $1125 on trucks of more than seven tons useful load in Georgia and a tax of $750 on seven ton trucks. Similar laws were introduced in half a dozen states last winter and some came near passing and some may pass at the next session.

Among the news items, is the idea that every automobile owner shall be required to supply a bond for compensation of injury he may inflict upon persons or property. Said a lawyer who is friendly to the industry recently:

"We must recognize that there are entirely too many irresponsible persons driving cars and that there is no form of adequate protection to the public. A man can buy a rattletrap for $350 and sail down the street, cripple the father of seven children and then sell his car. Such conditions are a menace to every vehicle owner. The situation must be cleared by wise legislation. I am not ready to suggest the solution, rather I think the industry must work it out before an outraged public becomes bolsheviki toward the vehicles."

And the question of taxation is far from being solved. There is more to this than the license fees.

Railroad and other transportation legislation is of vital interest to the automotive industry and trade. Some one must take the initiative in getting the truck established in interstate commerce.

Then again: A year ago several western states were threatening to do things to tractors Some of them are trying the experiments. Here is a work that will require initiative to meet.

# Wilson Favors Continuance of Federal Road Control

## *Opposes Bill Which Would Remove Work from Deparment of Agriculture and Create Federal Highway Commission—$1,000,000 for Roads in 1920*

WASHINGTON, Dec. 2—Opposition to a change in the management of national highways, as proposed by the so-called Townsend Bill creating a Federal Highway Commission, is evidenced in the President's message to congress today. He said:

"I would urge the continuance of Federal participation in the building of good roads under the terms of existing laws and under the direction of present agencies."

The President has been influenced, apparently, by Secretary Houston, of the Department of Agriculture, in whose department the Bureau of Public Roads is charged with the management of Federal highways. It is expected the bill will be introduced in the next session and its passage urged by many advocates of good roads who believe road development and maintenance is too large for handling by a departmental bureau.

In his report of Federal Highway construction the day previous to the President's stand on the Townsend Bill, Secretary Houston gave details of work already done, and work as planned by the department under the amendments to the highway bill. To overcome the ravages of war transportation on roads, he said, the department was preparing for vigorous prosecution of the work.

### THE WAR SITUATION

Under the Federal Aid road act of 1916 the government appropriated $75,000,000 to be matched by an equal amount from the states, for the construction of rural post roads over a period of five years, and $10,000,000—$1,000,000 a year for ten years—for roads within or partly within the national forests. This program had just been initiated when the United States entered the war and had to abandon it.

Following the armistice road work was resumed not only to repair damage caused through heavy war transportation, but also to provide adequate transportation facilities for industry and agriculture. Supplementing its former appropriation, Congress at its last session added an appropriation of $209,000,000 and also made several amendments to the former act.

Important among these amendments were the stipulations as to the kind of roads that could be constructed, and the increase of Federal contribution for any one road, from $10,000 to $20,000 a mile. These amendments have greatly facilitated selection of roads for improvement, and the actual work thereon.

Of popular approval of the national road building project, Secretary Houston points out in his report that $224,800,000 has already been authorized by residents in many states, and action is now pending upon the issuance of additional State road bonds totaling $314,000,000. With the state appropriations and the Federal aid funds, $1,000,000,000 will be available for road improvement in the present and the next fiscal year.

The only limiting factors to the construction work, Secretary Houston indicates, are the production of suitable road materials, rail transportation to the points of use, contractors' organizations available and the labor supply.

### ONLY THREE LIMITATIONS

Under the act as it now stands, the secretary declares, only three limitations are placed on the kind of roads that may be built. First—the roads shall be substantial in character. Second—that the amount contributed from the Federal treasury for any road shall not exceed 50 per cent of its cost or $20,000 a mile. Third—that the road must be a rural post road, that is, any public road a major portion of which is now used or can be used for the transportation of United States mails. This latter is the definition under the amended Federal act and means that few if any important roads will be debarred from receiving Federal aid, if other requirements are met.

One of the most successful former State highway engineers has been placed in charge of the Federal aid road work. An advisory committee composed of representatives of State highway commissions has been appointed to work with the Federal bureau.

Secretary Houston believes the government should continue its present policy of participation in road-building operations by the appropriation of $100,000,000 for each of the four fiscal years beginning 1922. In his report he shows that from July 1, 1918, to Nov. 1, 1919, 1,345 projects covering 12,159 miles were approved, at an estimated cost of $181,143,644. Of this $78,592,167 represented Federal funds.

Since first passage of the Federal aid act in 1916, there have been 1,927 projects approved involving the construction of 18,596 miles of road at a cost of $225,267,847, of which cost the government share was $95,498,140. In the construction of national forest roads 74 projects involving 923 miles were approved from July 1, 1918, to Nov. 1, 1919. Plans were completed for the improvement of fifty others aggregating 946 miles.

## Labor Conference Adjourns for Year

WASHINGTON, Dec. 2—The first International Labor Conference held under the provisions of the Peace Treaty was concluded here Saturday and adjourned subject to call. The next meeting will probably be held in 1920.

The committee drafted conventions providing for adoption of an eight hour day and a 48 hour week, alleviation of unemployment, indemnification of wage-earning mothers at the time of child-birth, for the granting of six weeks leave of absence prior to the birth of the child and an equal period immediately thereafter, and for State insurance.

The first conference witnessed considerable debate spent in protests against the seating of various delegates and against the preponderance of European nations in the governing body. Because it was the first meeting, much of the time was spent in perfecting the machinery and general organization. The delegates came from practically all countries that have signed the Peace Treaty and represented both labor and the employers. Albert Thomas, French labor leader, was chosen director general of the International Labor Office and will have his headquarters at the head of the League of Nations, where he will organize a staff and carry on the labor program started here.

### MAKE 30 PLANES DAILY

WASHINGTON, Dec. 2—Fifteen airplane factories are producing thirty airplanes a day in France, according to a report received by the Department of Commerce.

## British Oil Fields Are Disappointing

LONDON, Nov. 13—(Special Correspondence)—According to the American Chamber of Commerce in London the oil discovery at Derbyshire, England, which caused so much excitement some few months ago, has amounted to practically nothing.

The Hardstoft boring, at which the strike was made, is still the only one to have come in, and even there the flow is small. The bore hole is now down 2,800 ft. and has passed through two colliery workings, but the yield of oil was only about 2,000 gal. per day. A powerful pump, introduced in the hope of increasing the flow, has now broken down, and the oil is penned up in the bore hole, escape having been cut off by means of a safety valve. It is hoped, however, that the subterranean supply is good, because the flow

up to the present has been continuous.

The other borings, at Ironfield, Reinshaw, Ridgeway, Brimington Common and Heath, have not struck oil at all.

The American Chamber in London learns that drilling on these sites has been suspended owing to the non-arrival of the steel tubes necessary to keep the water out and to prevent oil from escaping in any subterranean crevice the drill may have passed through.

When the parliamentary secretary to the ministry of munitions was asked in parliament on Nov. 11 to say whether the prospects of getting oil were as good as they were supposed to be some months ago, his reply was that he should like to reflect on that before giving an answer.

## Industries Low in Coal Priority List

WASHINGTON, Dec. 2—The Government proposes to inaugurate war time coal saving measures and has again created a list of the more important coal consumers somewhat along the lines of the list in force during the war. Priority will be given in the order named; first to railroads to insure ample food distribution, next to the Army, Navy and Federal Government, State and County departments and institutions, public utilities and retail dealers. Industrial institutions are not regarded as being immediately vital and will not be given priority except in rare instances.

Public utilities have been instructed by Fuel Administrator Garfield to discontinue furnishing power, heat and light to industries that are not of immediate importance. Advertising signs and displays of various kinds requiring the consumption of coal, are to be curtailed and no coal is to be distributed for such purposes.

### CARS ON ISLE OF PINES

WASHINGTON, Dec. 1—In the Isle of Pines there are 175 passenger automobiles and forty motor trucks in use at the present time, according to a report from Consul Bardel. The traction all over the island is almost a perfectly level one, and the roads are covered with natural nodular gravel. This permits the use of very light cars for passenger service, and while some heavy tonneaux are seen, the large majority of automobiles on the island are of the 4-cylinder, 20 hp., 30-inch wheel variety. The motor trucks generally used are of 1 ton, although there are several carrying heavier weight, even up to 5 tons. Consul Bardel emphasizes the fact that manufacturers of automobiles should see to it that accessories and parts for cars are placed in stock with their respective agents on the island.

### TRUCKS FOR BOMBAY

WASHINGTON, Nov. 10—The Bombay Improvement Trust has purchased ten 1-ton Ford trucks and estimates that these trucks will replace ninety bullock carts and in addition will reduce the cost by 60 per cent.

# Detroit Makers Plan Early Boost In Car Prices

## *The Next Few Weeks are Expected to See Increases of From $100 to $900 in Many Models—Details Withheld But Will Be Announced Jan. 1.*

DETROIT, Dec. 15—Increases in the price of automobiles, both open and closed types, ranging from $100 to $900, will be announced by practically all manufacturers in the Detroit district within the next few weeks. While there has been no concerted action on the part of the manufacturers, the increasing cost of materials and the high cost of labor is said to make higher prices inevitable. While there are some who will not advance prices and the Essex Motors Co. has reduced the price of its touring car $100, the opening of the New York show will bring the announcement of large increases in nearly all the better known cars.

Essex officials split fifty-fifty in reducing the price of the touring model, adding another $100 to the price of the sedan. Prices of the Hudson will not be changed, according to officials of the Hudson Motor Car Co., unless there is some more radical change in the material situation than is now seen.

Increased prices of King models range from $50 on the road-king to $895 on the limoudan, a combination of the King sedan and limousine, embracing all the better qualities of both cars. The price of the King touring car will be increased $435 from $2,150, and the foursome will be sold for $2,585, an increase of $235. The road-king now sells at $2,550, and the present price of the King Sedan is $3,190. All of these prices will become effective with the new year.

President C. D. Hastings of the Hupp Motor Car Co. said his company was conducting an investigation as to costs and while material and labor costs were mounting steadily, virtually assuring an increase in price, no action had been taken.

Packard Motor Car Co. officials see no reason now for increasing the price of their cars. Packard, however, is protected by a clause in their sales contracts which calls for increased prices on cars ordered where the cost of production is increased after the customer's order has been taken and he has made a deposit. The customer, of course, is allowed the privilege of cancelling his order and withdrawing his deposit.

The new prices of Cadillacs will not be announced until the cars are placed on exhibition at the New York show. There will be an increase on all models but officials refuse to give them out at this time. The same is true of Saxon, Maxwell-Chalmers, and Paige.

The Maibohm sedan will be increased from $1,995 to $2,100, although changes in the prices of other models will not be given out at this time. It is the plan of the Maibohm company to equip the increased priced sedan with 34x4 in. wheels and tires for which there will be no extra charge. The pheaton will be equipped with 34x4 in. tires and new springs, which will necessitate an increase in the price of $28.46.

No other figures could be secured from manufacturers, all of those not mentioned specifically stating that their production departments were busily engaged in the compilation of production cost estimates on which prices would be based, any charges in which would be withheld until the New York show.

## British Transport Institute Proposed

LONDON, Oct. 29—(Special Correspondence.)—The efforts made to develop and co-ordinate road motor transport in Great Britain and form it into a part of a national scheme to reduce congestion of traffic and the cost and delay on the railways, are taking form.

The latest development is the calling of a meeting by Sir Albert Stanley, M. P., until lately president of the Board of Trade, and the chief officer of the Underground Railways and Bus Combine. At this meeting a resolution will be submitted stating that it is desirable that an institute be formed for the scientific study of questions relating to traffic and transport, and suggesting that those present should constitute themselves temporarily a provisional council.

### TWIN CITY OPENS BRANCH

MINNEAPOLIS, Nov. 29—The Twin City Co., maker of the Twin City tractors and threshers, has opened a branch warehouse in Kansas City, Mo., in charge of Ernest E. Laws.

### TO MAKE RUBBER GOODS

Milwaukee, Wis., Nov. 29—The Ludington Rubber Co., Milwaukee, is a new corporation with a capital stock of $100,000 organized to manufacture and deal in all kinds of goods made from rubber. The incorporators are W. G. Gruber, R. G. Hayden and B. F. Cooke, Jr.

# OVERLAND RECORD REACHED 500 A DAY

## *Trolleyless Situation in Toledo Not Permitted to Interfere With Production*

TOLEDO, O., Dec. 1—Production of the Overland 4 has reached 500 cars a day. The various factory departments are engaged in a spirited rivalry to accomplish their part of the operations, so that production may reach 600 Overland 4's a day before the first sleighing.

This record is further interesting in view of the fact that there are now no street cars in Toledo. The citizens at last voted in favor of an ouster ordinance. The railway company took the city at its word and sent the street cars into the state of Michigan. Despite this condition, the Willys-Overland factory has had an attendance of 100 per cent from its 12,500 workers since Toledo became trolley-less.

To get them back and forth from their homes each day, the Willys-Overland Co. has organized a complete transportation system of trucks, autos, jitney busses, and other conveyances. But at that, it means long walks and very early breakfasts for thousands of the Overland workers. But they get to work every day.

## Napoleon Company to Make Trucks

TRAVERSE CITY, MICH., Nov. 29—Napoleon Motors Co. will give up the manufacture of passenger cars and devote all of its energies to building the Napoleon truck, now being manufactured in 1 and 1½ ton models. The company plans to expand its business with an increase in factory space by construction of buildings to replace those lost by fire. The new structures will be used for export and domestic shipping, relieving the present plant of much pressure.

## Tractors Sought in Swedish Markets

WASHINGTON, Nov. 25—Of American agricultural machinery, the American tractor seems to have the largest field in Sweden at present, according to a report received by the Department of Commerce. The demand is great and Sweden's four factories, with an estimated output of 400, are entirely unable to meet the situation. These factories also turn out motor plows, grain threshers and portable steam engines. The 25 hp. type with pulling capacity of from two to four plows is preferred.

A large American agricultural implement house maintains an assembling plant in the country and makes repairs.

The tractors imported have come chiefly from America and England, but the demand is far greater than the supply, and bearing in mind the high price of grain, the lack of horses, and the great prosperity of the Swedish farmer, Sweden offers a lucrative market to the American manufacturer of tractors.

Due to the lack of gasoline the Swedish farmer has been using sulphite alcohol (pulp alcohol) with some success. Now, however, kerosene, which is preferred, is becoming cheaper and this fuel is now beginning to be used again. Kerosene now sells at 60 ore per kilo as compared with 12 ore before the war. Crude oil on the other hand is extensively used for larger engines.

The principal crops of Sweden are wheat, rye, corn, oats, meslin and legumes. The approximate total acreage of each is: wheat, 314,949; rye, 959,978; corn, 423,541; oats, 1,984,361; meslins, 473,705 and legumes 89,018.

## General Motors to Change Stock Issue

NEW YORK, Dec. 1—A special meeting of the stockholders of the General Motors Corp., has been called for Dec. 30 to consider amendments to the certificates of incorporation.

Action will be taken on the proposal of W. C. Durant, president of the corporation, recently approved by the directors, which provides for an authorized issue of 50,000,000 shares of common stock of no par value in lieu of the present authorization of 5,000,000 shares at $100 par common stock. None of the no par stock is to be issued for less than $10 a share nor can the directors declare dividends in an amount which reduces the value of the assets as shown on the books of the corporation to a point where the capital of the corporation with the common stock valued at $10 a share is impaired.

Concerning the proposed change President Durant said: "The plan, with all of the subscription rights taken up, will supply about $85,000,000 in cash for the corporation's treasury, which added to our present cash, sight drafts and Liberty bonds, will give us a total of approximately $175,000,000—ample to provide for the normal and safe expansion of the business, to properly develop recently acquired and extremely profitable liens and to maintain cash reserves sufficiently large to care for a gross business for the calendar year of 1920 as approximately $800,000,000."

### THEFT CURE LAW READY

DETROIT, Nov. 29—Automobile thieves will be confronted by a new law Jan. 1 that bids fair to be greatly effective in curbing thefts throughout Michigan. The statute requires automobile dealers and garage owners to make duplicate records, in ink, of all cars sold, purchased or exchanged, specifying the date of sale, purchase or exchange, the name of the purchaser or vendor, and the make, serial number, motor number and minute description of the vehicle. Copies must be forwarded to the secretary of state the first day of each month, the state department furnishing blanks for the purpose. First reports are due Feb. 1.

## Assn. Sanctions Minneapolis Show

NEW YORK, Dec. 1—Announcement was made today by M. L. Heminway, general manager of the Motor and Accessory Manufacturers Association, that arrangements have been made with the Minneapolis Automobile Trade Association, whereby members of the M. & A. M. A. will participate in the show to be held in Minneapolis from Jan. 31 to Feb. 7, 1920.

After a careful survey of the plan and jurisdiction of the Minneapolis show, it was determined to sanction them because of the important territory covered. The automobile men of the Twin Cities are making special efforts to make the Minneapolis show one of the most important exhibitions in the history of the industry in the Middle West.

To date the Motor and Accessory Manufacturers Association has sanctioned the automobile shows at New York, Chicago, Boston and Minneapolis. This is the largest number of official automobile shows sanctioned by the association in any one year.

### PARAGUAY MAKES AIRPLANES

WASHINGTON, Dec. 1—Plans have been approved by the Government of Paraguay for the erection of buildings, shops and hangars, for the future school of military aviation, according to a recent commerce report. Owing to the various difficulties, such as lack of shipping from Europe and the United States, nothing has yet been done in the matter.

However, the arrival at Asuncion of an Italian aviator in a direct flight from Buenos Aires has given a strong impetus to the interest in aviation. A club known as El Club Paraguayo has been organized for the purchase of airplanes. The Italian Government has already presented the Government of Paraguay with the hydroplane used in the flight from Buenos Aires to Asuncion on August 15 and also with an airplane, including spare parts and motors.

The French Aviation Commission, now in Buenos Aires, has been invited to Asuncion and it is expected that as a result of this visit, additional impetus will be given the aviation movement in Paraguay. Consul Balch advises firms advertising American aircraft to send their catalogs or other literature to El Ministerio de Guerra y Marina, Asuncion, and to El Aero Club Paraguayo.

### CHARTER OHIO BODY CO.

CLEVELAND, Dec. 1—The Ohio Body & Blower Co. has been chartered with a capital of $550,000 to manufacture automobile and commercial car bodies. The incorporators are T. H. Gogsett, Leslie Nicholas, T. L. Jones, W. T. Kinder and James P. Wood.

**Albert Rosenberg**, recently with the Stambaugh Thompson Co., has joined the E. G. Manufacturing Co. as sales representative in greater New York territory.

# Olympia Declared Detriment to British Motor Industry

## *With Nothing to Sell at the Show and a British Financial Combine to Boost Prices Suspected, Englishman Predicts a Great American Car Market*

LONDON, Nov. 14—(Special Correspondence)—There is a considerable opinion regarding the Olympia Show—based on a fair experience and test of it from observation—

(1) That it might better have been postponed till next year.

(2) That the crowds—about double the numbers at the 1913 show—make it impossible for business purposes.

(3) That there is nothing to sell, the makers being in the two categories of those with orders unfilled during all the past year, yet proposing to go on looking ahead on a gambling hope of being able to deliver—sometime, and those with order books filled with dealers'. contracts even beyond their estimated output up to next year's show, and

(4) That the occasion has introduced the most undesirable influence detrimental to the very stability of the British trade, namely a price ramp.

### PRICES UP $500

The result is universal soreness following disappointment engendered from the causes referred to under the second and third headings. The financial ramp has two aspects. The first refers to the sudden and unexpected price advance—during the show. The rate of this rise averages $500 and the reasons sought to justify it are some of them audacious. Rise of output cost, of course, is the basic reason, and for justification of it, reference is made to the fact that the moulders are on strike for higher wages, and that the engineers have been accorded an advance which equals $1 at present rate of exchange a week!

Material cannot possibly be advanced secretly, and there is no other evidence to justify this sudden advance, excepting that it forms part of a policy to restrain orders, or to prevent owners of cars on order being tempted to realize on their contracts.

Alternatively it is known that some makers are circularizing their customers with cars on order to the effect that they may cancel at option, and that their deposits will be refunded with 5 per cent interest. In either case the result cannot possibly help to retain confidence in the business, and it all points to a strengthening of the group of American cars on the market. The Overland, for instance, is listed here at $2,475 with a definite delivery date, while the British corresponding cars, i. e., those formerly priced $2,250 to $2,500, are now listed at $3,000 to $4,000, yet on the testimony of the president of the British Trade Society at the annual dinner the other night, labor cost has advanced by 110 percent and metals by 200 to 300 percent, while against the latter factor must be set a marked reduction of weight, averaging I should say roughly 500 to 600 lb. per chassis on the modern and larger sizes.

Another factor making for intrinsic reduced cost of output is the adoption of such American practice as en-bloc cylinders, overhead valves, indetachable heads, unit-engines, and gear-boxes with center controls, spiral-bevel axle gears (most of them cut by specialized gear-cutters), rear-hub twin brakes, steel disk-wheels, and press work axle casing and frame brackets. In the aggregate these details must go far to cheapen cost of production if the job be really tackled as it is possible to deal with it.

The second aspect of the show financial ramp is far more threatening, for virtually it affects the basis of the industry. Taking advantage of the wild rush of the public after cars, and the apparent inability to supply the demand by the British makers, the papers are filled almost daily with new prospectuses of old and new companies in quest of capital. Some of them have literally no assets but a specimen car and a reputed filled order book, while others, ostensibly with better justification, want a much larger capital to meet a demand, they so far have offered no evidence of having started to meet, for the fact is British motor production en masse does not exist.

### FINANCIAL EXPLOITATION

There is another side to this ramp, namely, the purely financial exploitation of certain groups of established and non-established companies. At the time of writing, rumor is too indefinite for the matter to be dealt with, and for the stability of the industry it is to be hoped that matters will not take the shape portended. At all events it may be repeated that there is report of a $30,000,000 deal to unify the distribution of the products of some five companies, not all of them hitherto in the front rank of British cars, and one of them not producing a car of their own design as yet.

This financial stunt obviously is a selling organization, and seeks to control the distribution, and through it the manufacture and financing of the cars concerned. It has about it the germs of a trust, and since Great Britain, temporarily as some of us hope, abandoned its free-trade policy, this species of commercial rigging the market seems shaping to flourish exceedingly and is likely to do so until, or as long as, there is mostly ill-gotten war wealth to be squandered. Another rumor of similar import is that a finance group in the banking district has bought up the potential output of three British motor firms, two of them being old established firms, and the other one makers of one of the novel and, to my thinking, commercially impossible type of car at this show.

What is likely to happen to the public who have ordered cars within these prospective combines is an interesting speculation, for ostensibly the orders given in good faith at the makers' stands are, or will be, part of the assets taken over by the trusts, and the public will find ultimately that they are paying toll to people of whose existence in relation to the makers of the cars concerned they were wholly ignorant. Maybe the sudden and otherwise inexplicable advance of price at the show is intended to meet this situation.

### THE MORAL

An instance of how the multi-million combine referred to is likely to bleed the public is worth noting, and I have seen the evidence of it in the dealer's agreement with one of the companies in the combine.

This man used to sell about 50 cars of a certain make yearly at 15 percent discount. He had placed his order with the company, quite ignorant of its being concerned in this combine. He has now learned the true situation, and has been informed that his discount rate is to be reduced to 10 percent, but that the net amount will be made good by advancing the price of the car. The public therefore will be bled to provide a handsome profit for the combine, a 10 percent rate for the dealer, as well as the manufacturer's profit.

The moral is obvious. The British motor industry indirectly and the British motoring public directly must be saved from these financial ramps by importing more cars to the number needed to stabilize conditions and the market. The cars wanted are in the classes referred to, and it will be doing Great Britain and British dealers in particular a service if American makers will release a larger number—and at once—of cars than they had decided to appropriate for their home market.

(Englishman)

### TAKE OVER PRIMER

NEWARK, N. J., Nov. 26—Manufacture of the Master engine primer has been taken over by the Splitdorf Electrical Co. of this city. The Master primer electrically heats gasoline drawn into the inlet manifold of an engine during the first few strokes and serves especially to facilitate starting in cold weather. The starter has been on the market for some time and is standard equipment on a number of cars.

# COAL STRIKE MENACE TO STEEL INDUSTRY

## *Plants Operating on Diminishing Reserves With New Supply Under Restriction*

PITTSBURG, Dec. 2—Quantity production in the iron and steel mills, after several months of inactivity due to the steel strike, is again threatened, this time the coal strike being the endangering factor.

"Mills have been running largely on stocks which are now running low," says the Wall Street Journal today. "There is much coal consigned to the steel mills, but it has been held by the railroads for distribution elsewhere in case of an emergency. Then there is the danger of beehive coke production being restricted, whereby the make of pig iron would be reduced.

"The Steel Corporation remains committed to its policy of selling for 1920 deliveries at the March 21 schedule of prices. Some of the independents have adopted this policy, some have not. The independent tin plate makers are practically a unit in following the same policy as the corporation, while in the sheet trade the policy is quite unpopular.

"Some independent sheet mills are openly demanding premium prices while others cover their policy by refusing to sell at all at this time, explaining that they are already sold well into next year. In line pipe premiums are the rule with sales by independents, and some premium business is being done in standard steel pipe. Merchant bars for early deliveries are selling at a premium. In the case of wire products the independents were $5 a ton above the Steel Corporation before the strike.

"While steel production is now about 75 percent of the rate just before the strike, that rate was somewhat under 85 percent of capacity, and thus production now is only between 60 and 65 percent of capacity. With a shortage of labor, indifference on the part of many men in employment and the necessity of giving many men several months of training before they can do their work well, production promises to increase but slowly and is hardly likely to be at capacity at any time in the discernible future. Production may be at 70 percent of capacity in December, gradually increasing to 85 percent by April 1."

## Boyer First in Los Angeles Race

LOS ANGELES, Nov. 30—Joe Boyer in a Frontenac won the feature fifty mile event at the Ascot Park races here Thanksgiving Day. Roscoe Searles and Joe Thomas in Frontenacs finished second and third, C. H. Kirkpatrick in a Detroit Special, fourth, and Arthur Klein in a Peugeot, fifth. The winner's time was announced as 41 minutes, 30 4/5 seconds, an average of 74.89 miles an hour.

The field was made up of twelve of the fastest cars that ever met in America on a one mile speedway. The starters besides those mentioned were Dutton, Vail, Durant, Hearne, Pullen, Nicholson and Goodsen. Dutton drove the Cooper-Stutz special; Vail, the Philbrin special; Durant and Hearne, Chevrolet specials; Pullen, a Locklear special; Nicholson, a Hudson special, and Goodsen a Frontenac. Ross in a Stutz, and Kaster in a Kaster special, had entered but both cars were eliminated by accidents in trial events.

Vail and Dutton were injured in a collision that demolished their cars. Vail is said to have suffered an attack of heart disease and is reported in serious condition.

**Publication of this issue of Automotive Industries has been delayed until Dec. 19 by conditions over which the publishers have had no control. Further issues will be forthcoming as rapidly as they can be printed.**

### ARRANGE OVERFLOW SHOW

CLEVELAND, Dec. 3—The Ohio Body & Blower Co. has taken orders for 12,000 automobile bodies for delivery beginning early this month. Most of the jobs, including orders from Jordan, Locomobile, Owen Magnetic and other companies, are for aluminum bodies, indicating a demand among manufacturers of high grade cars for 1920 in excess of former requirements.

Application will soon be made to list Ohio Body Co.. shares on the New York and Boston stock exchanges.

### GUARANTY CORP. GROWS

NEW YORK, Dec. 1—The Continental Guaranty Corporation of New York, dealing exclusively with automobile paper, has increased its capital stock from $2,000,000 to $3,000,000. The corporation has financed the time sales of automobiles for five years during which time its gross business has amounted to over $80,000,000.

Automobile dealers are assisted in stocking up through the corporation supplying them with letters of credit to their local banks. In the retail sale of cars on monthly payment basis, the Continental corporation buys the note of the purchaser secured by an unrecorded mortgage on the machine, and charges a guaranty fee. Application will shortly be made to list the stock of the corporation on the New York Stock Exchange.

### BERMUDA CONTINUES BAN

HAMILTON, BERMUDA, Dec. 1—The House of Assembly today again rejected a bill which would have permitted the operation of automobiles on the islands. The issue was bitterly contested and went down to defeat by a vote of 17 to 15.

# FULTON PRODUCTION WILL BE CONTINUED

## *Bright Outlook for Farmingdale Concern Now in Receiver's Hands*

NEW YORK, Dec. 2—Although a receiver has been appointed for the Fulton Motor Truck Co., Farmingdale, L. I., assurance comes from the officers of the concern that there will be no break in the sales and distribution of its product.

The value of the orders booked is said to be in excess of $2,000,000 while the liabilities of the company are less than $250,000. George C. Sherman, president, says that the company is exceedingly strong from the standpoint of distribution and sales, and that the appointment of a friendly receiver was brought about through the desire of the officials to effect a proper reconstruction of the affairs of the company.

The Fulton truck, in the estimation of Sherman, will be on the market continuously, and with no break in the sales and distribution. Business with the branches of the Fulton company, and with dealers and distributors throughout America has been exceedingly prosperous. The material situation has not interfered with production, and reports of the company for October showed the shipment of more than 250 vehicles.

C. M. Kraham, general sales manager, says that Fulton production is assured on a strong basis, and that the future of the company is bright.

## Oil Merger Includes Seven Big Companies

PITTSBURGH, Nov. 28.—Industrial and financial circles are watching with considerable interest the activities of the Transcontinental Oil Co., a consolidation of seven oil companies, with general headquarters in different cities of the United States.

Because of the immense amount of property involved, and the prominence in the industry of the men connected with it, the consolidation is important. In the new organization there are grouped: Riverside Eastern Oil Co., Riverside Western Oil Co, Riverside Oil Co. of Illinois, Gasoline Distributing Co., Pittsburgh Texas Oil & Gas Co., and the Tex-Penn Oil Co.

In the personnel of the company are included: Michael L. Benedum, of the Benedum-Trees interests, as chairman of the board of directors. President, F. B. Parriott; vice-president, O. D. Robinson, and on the board of diretcors A. B. Dalley, Jr., S. A. McCaskey, T. R. Cowell, O. D. Robinson, F. B. Parriott, George J. Wolf, Edward Kilpax, William Lilley, Hugh K. Prichitt and George W. Kendrick, 3rd.

# CITY BUILDS ROADS OUTSIDE ITS LIMITS

## *Louisiana Court Decides Action When Residents Approve at Election*

NEW ORLEANS, Dec. 1—The city of Lafayette, La., has adopted a new and novel method to encourage road-building in all that section of the state tributary to it. This plan appears to be the first of the kind ever tried by a city in this country, and has worked out to a highly successful result. The business men of Lafayette discovered about a year ago that during the rainy season their trade fell off considerably, and traced the cause to the impassable condition of roads leading to the city. Thereupon they "got together" with the city council and the state highway bureau, with the result that the city built improved, hard-surfaced highways from the center of town, in five directions to the boundaries of the ward in which Lafayette is located.

Lengths of these roads ranged from one to four miles, and the total cost of building them was $100,000, the proceeds of a bond issue, which the residents of the city voted overwhelmingly. It was a new and novel undertaking. So far as the state highway bureau could learn, no other city in the country had attempted such a plan of building roads outside its own municipal limits.

The object lesson, however, brought results at once. The farmers in the wards surrounding the one in which Lafayette is situated, struggled through the muddy dirt roads of their own wards, and then came suddenly out on a good, hard-surfaced road, permanent and capable of sustaining heavy traffic in the rainiest season. They turned to their own police juries and demanded good roads in their wards, with the result that Lafayette parish is rapidly constructing one of the best road systems in all Louisiana.

But when the city of Lafayette offered the $100,000 bonds for sale, the bond-buyers turned them down, because they feared the legality of the action of the city in attempting to build roads outside its own limits. A test case was prepared and carried to the Louisiana state supreme court, which sustained the legality of both the action and the bond issue. This decision is of interest to other cities, as the state's highest court held that a municipality has the constitutional right to construct roads connecting it with the surrounding country whenever its residents so decide at a legal election.

## Lafayette Moves Into Modern Plant

INDIANAPOLIS, Dec. 1—With a large, modern plant as a basis of operations, one of the gravest problems usually confronting new manufacturers has been automatically removed from the Lafayette Motors Co., of Indianapolis.

The present plant, while it is amply large to take care of immediate production requirements, is only the first unit of a model industrial layout. It was used by the Government during the war for the production of hand grenades.

The factory is now being equipped with machinery especially adapted to the advanced specifications of the Lafayette car designed by D. McCall White. The company plans to exhibit a car during the New York show and expects to be in production early next summer.

Situated at Mars Hill, a suburb four and one half miles from the center of Indianapolis, it is the intention of the company to encourage the development of the industrial community, already well started, as a principal source of factory labor.

### TITAN IN NEW PLANT

MILWAUKEE, Dec. 1—The Titan Truck Co., Milwaukee, today took occupancy of large additions to its plant which provide a total of 300,000 sq. ft. of floor space under one roof, including the original works. The company was founded in March, 1917, by Joseph Millman, formerly of the Stegeman Motor Car Co., and is now manufacturing Titan trucks at 2½, 3½ and 5 ton capacities. It is arranging for an output valued at more than $1,250,000 for 1920.

### CORRECTION

In the October 23 issue of AUTOMOTIVE INDUSTRIES, it was declared that Vickers had loaned $45,000,000 to China to buy airplanes. The Department of Agriculture, which issued information on this point, corrects the loan to $9,000,000, the amount that should have reported.

# NEW SKELTON CAR READY FOR DELIVERY

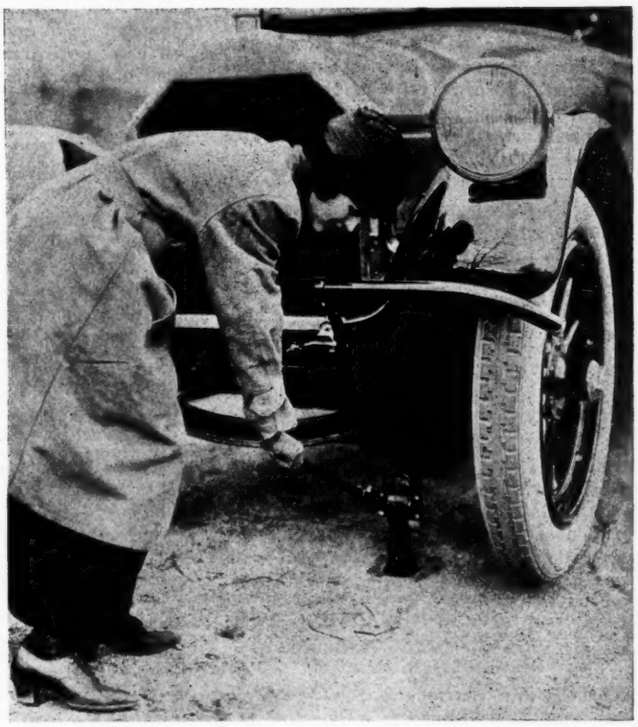
## *St. Louis Car Co. Product Will Sell for Approximately $1,245*

ST. LOUIS, Dec. 1—Deliveries of the new Skelton motor car, which is being built by the St. Louis Car Co. for the Skelton Motors Corp. are promised for early this month. The price will be approximately $1,245.

The frame of the Skelton will be of standard pressed carbon steel, reinforced over the rear axle; four cylinder motor, with long stroke, unit power plant, "L" head type, and removable head. It will have the Westinghouse starting and lighting system, Borg and Beck clutch, Muncie transmission, Hotchkiss drive and Carter carburetor, elliptic front and rear springs, of carbon, double heated steel will be used, and it will have a standard steering gear, with 18 inch corrugated wheel; one man top, two-piece wind shield; 15½ gasoline tank in rear and 32 x 3½ tires. The body is modeled on lines of the Cole.

The St. Louis distribution will be through the Meissner Skelton Co., of which Edward B. Meissner, president of the St. Louis Car Co., is president, and John T. Rogers, vice-president and general manager. Rogers was a lieutenant in the tank corps during the war, and has recently been with the St. Louis Post-Dispatch.

**New Duff Universal Jack Lightens the lift**



*Makers of automobiles are now, more than ever, giving thought to making their operation easier for women. The new Duff Universal Automobile Jack, shown in this picture, which will be exhibited for the first time in the New York Automobile Show, illustrates this tendency*

# DETROIT ENGINEERS HEAR WAR PROBLEMS

## *Attitude of Labor Abroad Precludes Competition with American Production*

DETROIT, Nov. 29—C. O. Hanch, general manager of Maxwell-Chalmers and formerly of the War Industries Board, Washington, and Howard Coffin, vice-president of the Hudson Motor Car Co., and formerly of the Aircraft Board, Washington, delivered addresses before the Detroit section of the S. A. E. here last night. The meeting was devoted to a discussion of industrial conditions in this country and abroad.

Hanch, who made a study of conditions in England, France and Italy shortly after the armistice and who is a member of the Allied Trade Conference, stated that England and France were anxious to see the cost of the war pro-rated to the United States. He stated that it is his observation that the foreign countries do not clearly recognize the unselfish principles for which the United States entered the war, and it is thought in view of the material benefits received by this country during the early days of the war that the United States should not enter the trade competition with the allied countries for a considerable length of time.

In discussing the equipment of the foreign automobile manufacturers, he stated that one of the points which struck him most forcibly was the lack of sheet metal equipment. Also, in spite of the attempt to secure quantity production on a progressive basis, he stated that with the state of mind of the laboring man in the European countries the task is impossible.

Hanch's talk brought out the fact that the most serious handicap in the way of England's production was the attitude of labor and the almost 100 per cent organization. He stated that it is impossible for the manufacturers to make a move without the shop steward's consent, the result being that production is handicapped and it is impossible to introduce methods which would tend to relieve the situation.

He stated that there are two fundamental habits of labor, one being diligence and the other idleness, unfortunately the habit of idleness has been instilled during the war rather than the habit of diligence and the result is that it will require a considerable length of time to change this back to habits of diligence in work. Hanch defined Bolshevism as a new name for a very old thing. He defined it as a condition of mind; a belief in the desirability of getting something for nothing whether by force or by compensation for doing nothing, or in any other manner.

Howard Coffin declared that while in England he was very much impressed by the remark made by Lord Reading before Parliament; "that there was only one thing necessary for the financial stability of England and that is for labor to get over its foolishness and go to work." Coffin pointed out how England and the Continental countries had reached quantity production under war conditions. The result was that when the war was over, it was confidentially expected that European countries would be able to enter into competition with America on a quantity basis, but it was forgotten that in reaching this quantity production all costs had been ignored, and when it was attempted to do the same thing on a commercial basis failure resulted.

Coffin mentioned the Australian dealer as typical. The Australian dealer, knowing that England had been producing cars on a quantity basis during the war, would not arrange with American manufacturers after the armistice, saying that he would prefer to patronize his own country which was now going to manufacture on a quantity basis. So the Australian dealer made contracts with the English car manufacturer, who was shortly to deliver cars on a large scale at much lower prices than were formerly in vogue. Every second month the dealer would receive a letter asking for a renewal of orders at an advanced price and yet no cars had been delivered, until finally the price rose to as much and more than before the war, and now the Australian and other foreign dealer is ready to buy his car where he can get deliveries and at prices more in line with what would be expected from quantity production.

Coffin spoke on the broad subject of preparedness and showed how the British were organizing their air forces under an air minister and were patronizing commercial airplane use in order to provide a means of recruiting the air forces in case of war. He stated that the British government was ready at the present time with the co-operation of the American government to establish transatlantic air mail service. He explained that a form of business letter could be now compressed to the size of a postage stamp by new methods and expanded in tape form at the other end so that a vast volume of mail matter could be carried.

## New Device Lights Car Automatically

RACINE, WIS., Nov. 26—A device for lighting at the proper time a car which may have been left at the curb has been developed by the Hays Mfg. Co. of this city. The basic feature is an eight day clock similar to an alarm clock, which can be set to close a switch at the legal hour for lighting. A lever at the base of the clock makes it operative or inoperative at will. The device, known as the Auto Automatic Lite, comes with two short flexible cables which are connected to the car lighting system, ahead of the regular switch.

### OPEN JERSEY BRANCH

NEW YORK, Dec. 1—Direct service to the trade in New Jersey and Pennsylvania is planned by the Standard Lamp Mfg. Co., through the opening of a branch at 313 Halsey street, Newark, N. J. The building there has been leased for a long term and after alterations will be opened about Jan. 1. An exclusively wholesale motor car equipment jobbing business will be carried on on a resale policy.

### EXCLUDE EMPLOYEE BIDS

WASHINGTON, Dec. 1—The Secretary of War has directed that in all auction sales of Government owned motor vehicles, all officials and employees of the War Department and all officers, enlisted men and civilian employees of the Army will be excluded from the field of bidders, and bids from any of these persons will not be accepted.

## Postal Motor Truck Routes Are Success

WASHINGTON, Nov. 29—The successful operation of three motor truck routes is reported by the Postmaster General in his annual report. The service has been operated for the conduct of experiments in truck service, being designed primarily to promote the conservation of farm products and facilitate their delivery and collection. When the service was first utilized, an effort was made to maintain it through connecting trunk-line routes, which policy was abandoned as being impracticable and the operations have been curtailed, and are now confined to given localities. The advantages of this service justify its continuance and extension.

The report emphasizes the importance of the construction of good roads to enable the postal service to extend motor truck routes. Below is the report of the three motor truck routes in operation.

| Terminals | Weight (pounds) First class | Second and third class | Fourth class | Total | Estimated Postage | Operating Expenses |
|---|---|---|---|---|---|---|
| McConnellsburg, Gettysburg, Soundersburg, Rising Sun, Philadelphia | 22,109 | 58,620 | 981,783 | 1,062,512 | $48,265.81 | $15,168.51 |
| Philadelphia, Wilmington, Easton | 5,162 | 21,083 | 115,953 | 142,198 | 9,834.67 | 3,826.08 |
| Washington, Gettysburg | 20,907 | 102,000 | 310,710 | 433,617 | 39,318.78 | 10,974.57 |
| Total | 48,178 | 181,703 | 1,408,446 | 1,638,327 | $97,419.26 | $30,269.16 |

# MOLINE-KNIGHT IS NOW R. & V. KNIGHT

## *Change in Name Coincident With New Design and New Engine*

EAST MOLINE, ILL., Nov. 29—Decision has been made by the management of the Root & Van Dervoort Engineering Co. to abandon the name Moline-Knight for its passenger automobile. Hereafter the company's cars will be put out under the trade name R & V-Knight, thus identifying the car more closely with the company.

With the adoption of the new name the company discards a designation which has become generally known throughout the automobile world, not only the United States, but in many foreign countries. The name of the car is changed in order to eliminate the confusion which has been caused by the use of the word Moline. This term has caused the automobile to be confused with other large manufacturers here.

The name of the Root & Van Dervoort Engineering Co. has become thoroughly known in the engineering field as representative of a large engine building plant and the trademark "R & V" goes on all of the large number of engines manufactured each year by the company.

Formerly there were two distinct corporations, the Moline Automobile Co. and Root & Van Dervoort Engineering Co. In 1917 these were consolidated and the Moline Automobile Co. passed out of corporate existence. The automobile took its name from the name of the company, the car first being known as the Moline, then as the Moline Dreadnaught and in 1913, when the Knight type of engine was adopted, it became the Moline-Knight.

The name is coincident with the appearance of entirely new models with new body design and a new engine. The company is this year equipping one of the models of its car with a six cylinder R & V engine, the only one of this type now manufactured in the United States. There will, for 1920, be two models, one on a six cylinder chassis with a complete line of body types and the other on a four cylinder chassis in five passenger touring and five passenger sedan types.

### DISPUTE PATENT RIGHTS

WASHINGTON, Nov. 29—To prevent the loss of the so-called "cracking process" of extracting gasoline from crude petroleum to the general public, it is claimed, a suit has been filed by Walter O. Snelling, former employee of the Bureau of Mines, who asks for an injunction against James T. Newton, Commissioner of Patents, to prevent the issuance of letters patent to Walter F. Rittman.

The petition states that Snelling, while employed in the Bureau of Mines, filed an application in the Patent Office in 1913 as the inventor of the so-called "cracking process," or Rittman process of extracting gasoline from crude petroleum. In 1915 Walter F. Rittman, who succeeded Snelling in the Bureau, made a similar application for patent covering substantially the same process and made dedication of his invention to the public.

March 15, 1915, an attempt was made through officials of the Bureau of Mines to amend the Rittman application by striking out the dedication to the public with a provision that patent, if issued, should be to Secretary of the Interior Lane as trustee for the public. In the following May Rittman filed further application identical with the former, but containing no dedication to the public, it is stated. If the second Rittman application is granted, it is stated, the process may be exploited commercially and the public lose the benefit of the dedication.

## U. of M. to Give Traffic Courses

DETROIT, Nov. 29—Highway transportation courses will become a part of the curriculum at the University of Michigan, classes starting Jan. 24, immediately following the highways transport convention at Chicago. In recognizing the importance of instruction in highway development and incorporating it in the course of study, Michigan blazes the trail for American universities. The department will be in charge of Prof. Arthur H. Blanchard, president of the National Highway Traffic Association, and a number of men who will participate in the conference at Chicago have signified their intention of taking the course.

Development of men with a knowledge of and trained in highway transport engineering, in the opinion of authorities at the Ann Arbor institution, is essential in promoting a comprehensive national highway system and the breadth of training in this branch of engineering must be broader than for many other technical branches, it is held. Economics, political economy, social science, business and contract law, scientific management, business organization, cost accounting, interstate commerce, marketing and distributing systems are regarded as fundamental subjects for the course which will include the following:

History of American transportation and rural development; English highway transport methods and legislation; inter-relationship of highway, waterway and railway transportation including influencing factors of distances, rates, kinds of freight and equipment; port, terminal and warehouse facilities; inter-relationship of highway transport, good roads and rural development; American highway traffic legislation including national, state, county, township and municipal laws, licenses and traffic regulations; fundamentals of highway engineering effecting economic highway transport; American highway transport methods and transportation surveys.

Ten courses in highway transport engineering will be offered at Michigan next year.

### GUIDE LAMP CO. GROWS

CLEVELAND, Dec. 1—The Guide Motor Lamp Co. has increased its authorized capital from $300,000 to $750,000, to provide for increasing the plant and adding equipment.

# BAY STATE DEALERS OPPOSE TROLLEY LINE

## *Will Urge Passenger Buses as Only Economic Public Transport Vehicle*

SPRINGFIELD, MASS., Dec. 2—Automotive dealers of Springfield are opposed to the proposed plan of the traction companies, to seek a subsidy in the form of a state tax levy for the operation of trolley systems, and plan to carry their fight on the bill before the legislature next month. The dealers claim they will prove the passenger bus to be the economic public vehicle of the future.

G. Clark Raymond, Jr., of the Reo Springfield Co., who is taking a leading part in the opposition to the proposed subsidy, says of the two modes of transportation:

"Comparing costs of operation by the passenger mile, which I believe is the only legitimate way to figure costs, it can easily be seen that even using the so-called one man cars, they cannot begin to compete with the gasoline driven passenger buses. The cost of the passenger mile on buses is a great deal lower with the present high prices of gasoline, oil and tires, than the trolley car with its long system of wire and trackage to maintain.

"In addition to leaving the whole thoroughfare open, clean and smooth, obviating the use of overhead wires, the passenger bus rides easier due to pneumatic tire equipment, and is more easily operated as it has the whole right side of the street to operate on. It takes and delivers passengers from the curb, relieving congestion in the centre of the street. Furthermore it cannot be held up by the failure of a preceding vehicle as are trolley cars.

"Actual operation of the passenger bus has shown that a twenty passenger bus operated on average city streets over average grades, can be run 30,000 miles a year at an average of 340 days a year, carrying 360 passengers a day at a cost of $4,282.90. This cost includes gasoline, oil, tires and an ample sinking fund for repairs, covers insurance, depreciates the truck completely in four years, covers garage costs, pays the operator $1,500 a year, and gives a net profit on the investment of $1,838.10."

### CALL CREDITORS MEETING

GRAND RAPIDS, MICH., Dec. 2—A meeting of creditors of the Grand Rapids Motor Truck Co. will be held on Dec. 6 at the office of Benn M. Corwin, referee in bankruptcy, 314-316 Houseman Building, to consider and pass upon the report of Thomas Bradfield, trustee. The report shows that the suit brought recently in Kent County Circuit Court to enforce an alleged stockholders' liability to creditors, had been decided adversely to the trustee. Decision will be made by creditors whether to appeal the decree to the Michigan Supreme Court.

# AIR MAIL SERVICE GROWS 50 PER CENT

## *Postoffice Statement Shows Six Months' Increase in Mileage of 244,446*

WASHINGTON, Nov. 29—A 500 per cent increase in air mileage, with a corresponding gain in mail collections and deliveries has been made in the last six months by the Air Mail Service of the Post Office Department, according to a statement issued by the department today.

Between May 15 and Nov. 22 this year, the air mail has flown a total of 305,619 miles, or more than the distance of twelve times around the world. During the six months preceding, air mail planes flew but 61,173. The gain is explained by the fact that on May 15, 1919, was inaugurated the New York-Chicago air mail route, an air line of 710 miles, navigated once daily in each direction. Prior to this extension the sole air mail line was from New York to Washington, a distance of 218 miles, navigated then as now, once daily in each direction.

The Air Mail Service has had three fatalities during the past six months, or one fatality for each 101,875 miles flown. Each of these deaths occurred to pilots flying low in bad weather and apparently seeking emergency fields for landing.

At the same time, there have been thirty-four forced landings, due to mechanical troubles. This amounts to one forced landing for every 8,988 miles flown, or a distance equal to approximately four round trips between New York and San Francisco.

On the route between New York and Washington there were nineteen forced landings, or one for each 3,742 miles. On the route between Cleveland and Chicago there were eight forced landings in 120-, 923 miles flown, or one for each 15,115 miles. On the route across the Alleghenies, between New York and Cleveland, there were seven forced landings in 113,-595 miles flown, or one forced landing for each 16,226 miles operated.

Fourteen of the forced landings were made with Curtis R4 planes equipped principally with high compression Liberty 400 hp. engines and fourteen forced landings with DH4 planes, equipped with Liberty 400 hp. engines. The other six forced landings were divided between other types of planes. The principal causes of forced landings were: oil pressure, seven; radiator trouble, four; gas pressure, three; foul plugs, three; carburetor trouble, three; short circuit in rain, two, and loose connecting rods, two.

To-day the Air Mail Service is operating eighty-five serviceable planes. Six months ago it operated forty. The principal improvements installed in this period are: the use of fire-proof mail compartments, carburetor screens preventing back fire, and compressed air fire extinguishers, operated automatically, perfected by Dr. L. T. Bussler, superintendent of the Air Mail Service. Use of parachutes is also being considered.

The Air Mail Service of the United States is now, according to an additional report just issued and contained in the annual report of the postmaster general, the only practical commercial airplane service in the world. No foreign service compares with it in magnitude, dependability or benefits to commerce. Following the first successful year of operation of the Washington-New York route, when the record performance of 96.54 per cent was obtained, with more than 30 per cent of the trips made in rain, fog and mists, two new routes were established (a) New York to Cleveland, (b) Cleveland to Chicago, expediting the delivery of mail from New York to the Middle West by 16 hrs. and from New York to the Pacific Coast cities by 24 hrs. Similar advantages were obtained for the east-bound mail. Approximately 5,000,000 letters are being carried in each direction from New York to Chicago; eight planes are being operated daily on the three routes, each with a capacity for 16,000 letters and flying an aggregate of 1,906 miles daily, carrying more than thirty million letters per year. The air mail postage rate which at first was 24 cents an ounce, has been reduced greatly by the inauguration of large planes and various mechanical developments until it is now 2 cents per ounce or fraction thereof. The principal mechanical developments of the year were the salvaging of a large number of Army airplanes rendered surplus to the War Department with the conclusion of the war; certain distinctive mail carrying airplanes with from ¾ ton to 2 tons letter capacity; the construction of a radio signal device that will guide an aviator to the center of his landing field in any weather, and the production of airplane compasses and spark plugs for powerful high compression engines.

## Mississippi Plans Huge Road Program

JACKSON, MISS., Nov. 29—The next Mississippi legislature will authorize the issuance of $25,000,000 in bonds to assist the federal government in building good roads through the state, according to X. A. Kramer, state highway engineer, who has been making a detailed survey of the opinions of every member of the legislature on this subject.

The bond issue and the interest on it is to be repaid by taxes on automobiles, trucks, etc. Owners and dealers in automotive vehicles are a unit in supporting this bond issue, and thousands of letters have been written to the members of the legislature, asking them to vote for the bonds.

Banks of Mississippi, led by R. L. Smallwood, president of the Bank of Commerce, of New Albany, have offered to buy the bonds at par as soon as they are put on the market. Kramer is confident that the people will vote the bond issue by a large majority. The federal government will put up $25,000,000 as soon as the state passes the bill for the bond issue of $25,-000,000, thus giving Mississippi $50,000,-000 for good roads.

## British in Market for American Parts

NEW YORK, Nov. 30—AUTOMOTIVE INDUSTRIES has been asked to supply the names of reliable manufacturers who would care to bid on a number of chassis frames, crankshafts, and helical gears for British trade. The purchasing agent having the matter in charge is Robert H. Lash, 29-31 Portugal street (Kingsway) London, W. C. England. An opportunity to examine the drawings may be had by applying to the Contract Department of AUTOMOTIVE INDUSTRIES.

There has been some difficulty in obtaining the parts in sufficiently large quantities and due speed in delivery. In the near future about 500 chassis frames of special design will be required, 500 crankshafts, about 1,000 camshafts, and a large number of gears. The company concerned has been using a straight-tooth gear temporarily, but what is wanted is the helical type gear, which is hard to get in England, as the comparatively few manufacturers who specialize in them are overworked.

The preferred form of crankshaft is with the balance weight forged on and the shaft ground to size and finish. If there is difficulty in supplying shafts with the balance weights forged on, an alternative design without weights will be considereed.

The prices asked for the material must include packing, etc., and delivery f.o.b. New York. Cash payments can be made on shipments.

## Beverly Speedway Nearing Completion

LOS ANGELES, Nov. 28—The speedway to be made at Beverly is now past the blueprint stage. The first course of heavy timbers to support the board surface of the track is in place.

The track is 1½ miles long and guaranteed by Jack Prince, the veteran track builder in charge of construction, to allow a speed of 110 m.p.h. in the stretches. No part of the track is exactly level. The extreme bank is at a 35 degree angle. The A. A. A. contest board has restricted the Los Angeles speedway to 18 starters.

### NEW BRUNSWICK SHOW

NEW BRUNSWICK, N. J., Dec. 5—The New Brunswick Motor Trade Association will hold its second annual automobile show at Armory during the week of Jan. 31 to Feb. 7. To this year's show have been added trucks and tractors which enlarges the show over that of last year. W. A. Kuehl, manager of the New Brunswick branch of W. E. Mount, Ford dealer, has been again selected as show manager.

### TO MAKE SPECIAL TOPS

CLEVELAND, Dec. 1—The Observation Sedan Top Co. has been chartered with a capital of $100,000 to manufacture special tops. The incorporators are Ben B. Wickham, A. L. Welch, E. P. Fenstenhaven, H. E. Werner and M. L. TeLeeken.

# AMERICAN CARS LEAD IN AUSTRALASIA

## *More Popular Than British as They Meet Road Conditions Better*

NEW YORK, Dec. 1—In a statement on the popularity of American cars in Australia and New Zealand, F. E. Wodell, trade investigator in Australasia for the General Motors Export Co., says there has been a noticeable increase in the past year, in the demand for designs represented by American practice.

American cars have a high reputation in Australia and New Zealand, he said further, and will continue to dominate the market there, although there will always be some demand for British cars. Among the American cars in the field, the Buick is predominant, he said, its sturdy build and powerful valve-in-head engine being especially fitted for road conditions there. Lighter and under-power British cars fail to meet conditions.

Other most popular cars are Dodge, Hupmobile, Oakland and Chevrolet, Wodell asserts. Post-war British models have not arrived except several for demonstration. Vauxhall and Austin are represented by demonstrators and are getting some orders, though prices are considerably higher than American cars of the same type. Falling exchange rates are bringing the prices closer together, but Wodell does not think this will be an important factor in motor car sales unless the pound drops as low as $3.50.

There has been an embargo on importation of complete cars, though one body has been permitted entry to every two chassis. Parts of such bodies and equipment are taxed at various rates ranging from 10 percent to 110 percent of the value. A considerable body building business has developed in Australia, though the manufacture of complete cars has not been encouraged.

The costs of motoring in Australia are considerably higher than in the United States. The initial price of a car there is about twice as much as in this country due to packing charges, freight charges and import duties. Prices of gasoline and oil are also high—the former selling at about sixty cents an American gallon and the latter $2.40 an American gallon.

Australia and New Zealand are prosperous countries and are giving much attention to the subject of good roads. Plans for improvements will bring new impetus in motoring everywhere within their borders.

### DELAWARE CHARTERS

WILMINGTON, DEL., Nov. 29—The following concerns have been chartered under the laws of Delaware:

Bowden Motor Corp., of Chicago, with a capital of $500,000, to manufacture and sell motor vehicles of all kinds. The incorporators are Charles L. Bowden, R. R. Hamilton and Albert C. Bell, all of Chicago.

Carbon Motors Co., Ltd., of Wilmington, with a capital of $300,000, to manufacture automobiles. The incorporators are W. F. O'Keefe, George G. Steigler and J. H. Dowdell, all of Wilmington.

Fox Motor Car Co., of Philadelphia, with a capital of $5,000,000, to manufacture and sell automobiles. The incorporators are F. R. Hansell, E. M. McFarland and J. Vernon Pimm, all of Philadelphia.

Peoples Bus Line, Inc., of Marshallton, Del., with a capital of $60,000, to operate a freight and passenger motor service between Wilmington and Marshallton. The incorporators are Richard G. Cross, Marshallton; John C. Ditch, The Cedars; John W. Greenfield, Roselle, and W. Scott Monckton, Brack-Ex.

Cleveland Motor Trucks Corp., with a capital of $1,000,000, to manufacture, deal in and sell motor trucks. The incorporators are L. B. Phillips, M. S. Anderson and I. J. Baynes, all of Dover, Del.

Lincoln Motor Sales Co., of New York, with a capital of $400,000, to manufacture, deal in and sell automobiles, airships, etc. The incorporators are A. W. Britton, S. L. Howard and Robert K. Thistle, all of New York.

Walker Accessories, Inc., of Wilmington, with a capital of $20,000, to manufacture and sell automobiles and equipment. The incorporators are M. L. Horty, M. C. Kelly and S. L. Mackey, all of Wilmington.

## Motor Truck Shows Biggest Ever Held

NEW YORK, Nov. 28—New entries for the National Motor Truck Show are being received almost daily. The latest report from the office of S. A. Miles, manager of the National Automobile Shows, is that 76 different makes of trucks will be on exhibition; 66 of which will enter the New York show and 58 the Chicago show. Constantly increasing interest is being shown also in the program for the transportation conference which will be held in connection with the truck shows at the same time as the passenger car shows; at New York during the week Jan. 3-10; at Chicago, Jan. 24-31.

### FORM SPARK PLUG CO.

FINDLAY, O., Dec. 1—The Rummell Mfg. Co. has been incorporated here with a capital of $75,000 for the manufacture of spark plugs for automobiles. The plug is the invention of Harry B. Rummell, one of the directors.

### DEALERS REORGANIZE

ROCKFORD, ILL., Nov. 29—An annual meeting of the Rockford Automobile Trade Association will be held Dec. 2, following its recent reorganization. The associaton, formed previous to the war, lapsed when many members were called into service. New organization plans call for four divisions—automobile dealers, vehicles, garages and equipment and battery. There are about forty members now and this number will be doubled when plans are completed. W. B. Taylor is president.

# SIXTEEN WHEELED VEHICLE PROPOSED

## *Inventor Claims Greater Riding Comfort at High Speed Than Present Vehicles*

NEW YORK, Nov. 28—Hippolyte W. Romanoff, a Russian inventor residing at present in this city, has been granted a U. S. patent on a 16-wheeled vehicle for which he claims greater riding comfort at high speed and greater economy of power than is obtained with four wheeled vehicles. There are four four wheeled trucks, one at each corner of the vehicle. Each wheel turns on an independent spindle and the four spindles are supported by a linked parallelogram, so that if one wheel rises over an obstruction all of the wheels remain vertical. The linked parallelogram is slidingly mounted on a vertical post, being suspended thereon between upper and lower helical springs. The two posts of one four wheeled truck are rigidly connected by a horizontal bar at the top, except that the posts can turn in this bar for steering. There are no axles properly so called, the vehicle body being supported by brackets having a pivot joint with the horizontal bars at the middle of their length.

Mr. Romanoff formerly was a manufacturer of electrical machinery in Russia, having large factories in Odessa and Petrograd. He was forced to leave the country by the Bolsheviki.

### ISSUE DROP-FORGING LIST

PITTSBURG, Dec. 2—The Union Switch & Signal Co., Swissvale, Pa., has recently issued a new bulletin on drop forgings containing illustrated descriptions of many new parts added to their range of product, more particularly in heavy forgings for trucks such as axles, spindles, kunckles, brake-bands and other parts. The company now has a capacity of 1,500 tons of forgings a month and is equipped for completely machining crankshafts ready for assembly.

### CARS LEAD TRAFFIC

DES MOINES, Nov. 21—Eighty-two per cent of traffic over the primary road systems of Iowa is motor driven, according to figures given out by the state highway commission which has been making observations. The figures were arrived at after observations made at 87 stations in 36 counties of the state and the count is thought to be fairly representative of the entire main highways of the state. Wright county showed the highest per centage of motor driven traffic with 92.8 per cent and Plymouth county was second with 91.6 per cent. The lowest per cent was 53.1 in Adams county.

A number of other figures given out as a result of the observations are interesting. They showed that 47 per cent of the traffic was strictly local. Forty-six per cent was interurban or intercounty and three per cent was interstate or tourist traffic.

# "AMERICA FIRST" IN SALE OF WAR GOODS

## *Director of Sales Rebukes Attempt to Divert Materials to Foreign Markets*

WASHINGTON, Nov. 30—The War Department authorizes the publication of the following statement from the office of the director of sales:

"In view of the concerted attempts made by certain industries to divert particular surplus stocks of war materials from the domestic to the export market, the director of sales takes this opportunity to state briefly the sales policy that controls disposition of surplus supplies for foreign consumption.

"Full and adequate opportunity is afforded the American public to acquire the surplus supply of each and every commodity and material held by the War Department before attempt is made to dispose of any part of the surplus for export purposes. The export market is developed only for those surplus stocks the supply of which exceeds the quantity that the domestic market is capable of consuming, or for which, because of the manner of manufacture, there is no demand except that existing in foreign markets.

"In offering its surplus war materials for sale to foreign governments or peoples, the War Department does not extend to the foreign buyer any terms of sale which are not afforded domestic consumers, except, in a few instances a period of credit. The exception as to credit is not made to any foreign buyer who purchases with a view to reselling at a profit, but is granted only to distributing agencies which, set up for relief purposes and acting under governmental sanction, provide a channel through which the commodities or materials may reach the ultimate consumer. Preference as to price and selection is given the domestic buyer.

"The disturbed state of labor and unseasonable weather have seriously curtailed the production of raw materials in the United States, with the result that stocks of both raw and finished products are extremely low in the nation's primary markets. As a consequence, the domestic demand for practically all of the surplus war materials held by the War Department is so strong as to make domestic offers for these stocks more attractive than those which are being received today from foreign countries.

"My attention has recently been invited to the pressure that is being brought by members of the National Machine Tool Builders' Association upon members of the Congress to have the legislative branch of the government direct the War Department to attempt to market as large a part as possible of its surplus of machine tools in European countries.

"The War Department has a large stock of surplus machine tools. It is attempting to market those tools to the best advantage of the government, and, with this object in view, is offering machine tools for sale both at home and abroad. By contract, dated Sept. 5, last, it sold to Belgian manufacturers, in whose interest the Belgian government had established considerable credit through American financiers, more than 2,500 machine tools, which are now being selected by Belgian representatives and put in transit; it is negotiating with the French government for the sale of an additional large number of machine tools held by the War Department in the United States.

"But there is a strong demand on the part of American users of machine tools for certain types of tools of which the War Department has a stock. The American manufacturers need these tools to increase their production and enhance the wealth of the nation. They are willing to pay good prices for those which they desire to acquire. The War Department stands ready to sell its surplus stock of machine tools to these domestic users. It is filling its machine tool orders in the sequence of their receipt. No machine tool is being held off the market to be applied upon the Belgian contract. Tools are consigned to that contract only after they have been actually selected by the Belgian representatives.

"The surplus supplies held by the War Department were acquired with funds furnished by the American people; the War Department proposes to give the American people the opportunity to derive any benefit that may inure to them through the sale of these surplus stocks."

## Service Truck Prices Advance

WABASH, IND., Dec. 1—New prices on Service motor trucks will become effective Dec. 5, according to announcement from the factory today. The advance, it is declared, is made necessary by increased manufacturing costs, and is the lowest possible advance to insure a fair margin of profit to the company and continued co-operation with the sales organization.

New Prices are:

| | | |
|---|---|---|
| Model 220, 1 | ton | $2,245 |
| Model 31, 1½ | ton | $2,785 |
| Model 36, 1½ | ton special | $3,215 |
| Model 51, 2½ | ton | $3,245 |
| Model 71, 3½ | ton | $4,085 |
| Model 76, 3½ | ton special | $4,285 |
| Model 101, 5 | ton | $5,145 |

### OGREN OUTPUT SOLD

MILWAUKEE, Dec. 1—The Ogren Motor Car Co., Milwaukee, a $500,000 corporation organized early this year by Hugh W. Ogren, former racing pilot, has completed work on the equipment of its factory at 602-618 National avenue, where 35,000 sq. ft. have been made immediately available. Adjacent land has been acquired for additions to be erected early next spring. The present capacity is about 400 cars a year. The entire output for 1920 has been contracted for. The Ogren car is being made in a single chassis model rated at 72 h. p., and was designed by Ogren.

## Tommy Milton Goes 113.5 Miles in Hour

SHEEPSHEAD BAY, N. Y., Nov 28—Another Duesenberg track record was made here Tuesday, Nov. 25, when "Tommy" Milton, driving the rebuilt Duesenberg 300 cu. in, piston displacement car, whirled off 113.5 mi. in an hour.

This trial, as in the other recent tests, was under A. A. A. observation, and the figures have been submitted to the Contest Board for action. The day was cold and a high wind forced Milton to push his car to the limit to accomplish the task.

### THE KANSAS CITY TRACTOR SHOW

**KANSAS CITY, Dec. 3—The Kansas City Tractor Club announced today that the Fifth Annual National Tractor Show, which was scheduled for Feb. 9-14, will, instead, be held Feb. 16-21. The change was made to afford more time for the moving of the Minneapolis exhibits to Kansas City.**

**Setting the date later has been endorsed by the exhibitors. With the show space doubled this year, Kansas City is looking forward to the greatest indoor tractor show ever held.**

### FORM TARKINGTON CO.

MILWAUKEE, Dec. 1—J. A. Tarkington, for more than twelve years consulting engineer and superintendent of the Kissel Motor Car Co., Hartford, Wis., has resigned, effective Jan. 1, to become president and general manager of the Tarkington Motor Car Co. of Rockford, Ill., which he has been instrumental in organizing. The new concern will manufacture a 3,000 lb. passenger car with a 124 in. wheelbase, to be named the Tarkington. Deliveries will begin about May 1. A new factory will be erected, the first unit being 64 x 500 ft.

### THERMOSTAT PRICE DROPS

CHICAGO, Nov. 28—The price of the Mayfield Motor Thermostat has been reduced from $17.50 to $12.50, the price including installation. This is a device made by the Beneke & Kropf Mfg. Co., and enables the car to warm up quickly in cold weather by retarding the flow of the circulation water.

### PREPARE DIRECTORIES

DETROIT, Dec. 1—The Sixth Annual directories for the New York and Chicago National Automobile Shows are being prepared by F. Ed Spooner, 420 Book Building, Detroit.

### PHARIS TIRE EXPANDS

**NEWARK, O., Dec. 1—Papers have been filed with the secretary of state increasing the authorized capital of the Pharis Tire & Rubber Co. from $100,000 to $1,000,000. The concern has been operating a plant for the past five years. The increase is necessary to provide for increases and additions to the plant. It is planned to erect three new buildings at once.**

# BACON MOTORS CORP. TO MAKE LIGHT SIX

## *New Company With $1,500,000 Capital Will Locate at New Castle, Pa.*

NEW CASTLE, PA., Dec. 1—Formation of the Bacon Motors Corp., of New Castle, for the building of a light six, moderately priced car, is announced by Frederick C. Van Derhoof, president. Van Derhoof resigned as general manager of the automobile department of the Standard Steel Car Co., Pittsburg, to accept the presidency of the new corporation.

The car will be produced early in the spring at the newly acquired factory in New Castle. Capacity of the present building will be about 50 cars a day. This will be increased with the erection of a three story factory for a body building, upholstery and painting department, which is soon to be started. Other buildings will be added from time to time on the tract, which comprises 21 acres.

The corporation is capitalized at $1,500,000 and this will be increased to $2,500,000. Officers and principal stockholders of the corporation are men with leading business interests in Pittsburg, New Castle and other cities. Besides Van Derhoof they are F. W. Bacon, vice-president; George N. Glass, secretary and treasurer; directors, D. W. McNaughton, C. D. Scully, W. E. Provost and Edwin N. Ohl. E. C. Hopkins is assistant secretary and treasurer and H. L. Archey, salesmanager.

The engineering department is to be in charge of Erling Oyen, who resigned from a similar position with the Standard Steel Car Co. Production will be in charge of efficiency experts employing the progressive track system of building. Assurance of ample supplies of material have been given.

## Court Interprets Insurance Clause

WASHINGTON, Dec. 2—Where goods are bought on "cost, freight and insurance," the purchaser is not bound to accept the certificate of the broker or of anyone else, that the goods had been insured, but he is entitled to call for the delivery of the actual policy of insurance, according to a decision made in the British High Court recently in the interpretation of "c. i. f."

The Court found for the buyers on the ground that they were not obliged under their contract to take up the documents relating to goods, since there was no policy of insurance among them. In practice quite a number of "c. i. f." contracts are completed without production of a specific insurance policy, but in face of this judgment shippers will probably include them with the other documents.

Much of the import business in England is done on the "c. i. f." terms of purchase. The purchaser in such cases, upon acceptance of the usual draft, is handed the bill of lading and other documents so that he can take delivery of the goods on arrival of the vessel. In the case above referred to the goods had been sold "c. i. f.," cash against documents, but the documents did not include the policy of insurance and the purchasers refused to provide the cash. Correspondence followed, and in the meantime the market for these particular goods weakened and the sellers entered action for loss brought about by non-acceptance.

## Tractor Association in Minneapolis Show

MINNEAPOLIS, Dec. 1—The annual northwestern automotive show this season will be known as the Twin City Automotive and Industrial Exposition. The dates are Jan. 31-Feb. 7, and the place is the Overland building in the St. Paul Midway, adjoining the Minneapolis line, where the show was held two years ago.

It will be a national show this year as to equipment and tractors. The Northwest Tractor Trade Association has voted to join in. The space available in the building totals 420,000 sq. ft. on five floors.

### SPRINGFIELD SHOW DATE

SPRINGFIELD, MASS., Dec. 2—The Springfield passenger car, truck and equipment show will be held March 1 to 7, inclusive, under the auspices of the Springfield Automotive Dealers Association, F. A. Caldewood, president; Harry Stacy, secretary.

### BODY CO. IN NEW FACTORY

LANCASTER, PA., Dec. 3—The Lancaster Body Co., successors to the Mack Body Co., has taken possession of its new factory and is prepared to go ahead with the manufacture of all kinds of car and truck bodies.

### WHITE OFFICES MOVED

NEW YORK, Dec. 1—Announcement is made of the temporary location of the domestic and foreign sales departments of The White Company, in the Abercrombie and Fitch building, Forty-fifth street and Madison avenue. The service department will remain 631 West Fifty-seventh street.

**Timken-Detroit Axle Co.** will increase its authorized capital from $6,000,000 to $48,000,000, the plan having been approved by stockholders of the company. The common stock will be increased from $3,000,000 to $30,000,000 and par value reduced from $100 to $10 a share. There will be an authorized issue of $15,000,000 preferred stock in addition to the $3,000,000 now outstanding.

**Pennsylvania Rubber Co.**, Jeannette, Pa., will pay its regular quarterly dividend of 1¾ percent on preferred stock, and 1½ percent on common stock on Dec. 30, to stockholders of record Dec. 15.

# Financial News

**Timken-Detroit Axle Co.** is offering a new issue of $5,000,000 of 7 percent preferred stock at par and dividends. The proceeds will be applied in part to the retirement of present outstanding stock and the redemption on Dec. 1 of the company's outstanding 7 percent serial notes.

**Edward G. Budd Mfg. Co.**, makers of all-steel automobile bodies, will make a $2,000,000 increase in the 8 percent preferred stock of the company, bringing the total to $4,251,700. The proceeds will be applied to plant extensions.

**Fisk Rubber Co.**, in a balance sheet taken Sept. 30, the first since the retirement of the old first preferred stocks and the issue of the new first and second preferred, shows a surplus of $8,009,143, as compared to $6,364,465 on Dec. 31, 1918.

**Fisher Body Corp.**, for the five months ending Sept. 30, reports surplus of $1,154,341 after charges, taxes and preferred dividends, equal to $6.77 a share on the 200,000 shares of common stock.

**Overland Tire Co.** has voted at a special meeting to declare quarterly instead of monthly dividends. The next disbursement is expected in December.

**Selden Truck Sales Co.** has authorized the issuance of $1,000,000 8 percent first preferred stock, $300,000 second preferred stock, and 30,000 shares of no par common stock.

**Studebaker Corp.**, for the nine months ending Sept. 30, reports net profits after interest and taxes of $7,023,386, equal after preferred dividends to $21.53 a share on the $30,000,000 common stock, as compared to $3,884,194 or $10.38 a share for the 12 months ending Dec. 31, 1918. Stockholders of the company have ratified the plan to increase the authorized capitalization from $45,000,000 to $90,000,000, all of the new stock to be common. Of this $15,000,000 of the new common will be offered to shareholders of record Nov. 29 for subscription at 105.

**Lee Tire & Rubber Co.** stockholders have taken practically all of the stock recently offered for subscription at $33 a share. Over 80 percent of the issue was reported taken by Nov. 28, the day subscription rights expired.

**Willys Corp.** has notified holders of preferred stock that all of the issued and outstanding existing preferred stock has been called for redemption on the dividend payment date for the quarter ending Dec. 31, at 110 percent of the par value thereof, plus the amount of any accrued and unpaid dividend or dividends. Certificates for redemption are to be presented at the Chase National Bank on or after Jan. 2, 1920.

## Traffic Truck Corp. Names Distributors

ST. LOUIS, Dec. 1—A departure in truck distribution inaugurated by the Traffic Motor Truck Corp. in St. Louis is to be extended to other cities. The plan closely follows the distribution of passenger cars as practiced by the Ford Motor Co., in that a group of dealers are appointed in each big city, but is different in that service stations will be maintained by the traffic corporation, leaving the dealer free to give his entire time and attention to the sale of trucks.

Nine dealers have been appointed to cover St. Louis, St. Louis county adjoining, and East St. Louis, across the Mississippi. Service for trucks bought through the dealers will be handled at the factory in St. Louis. The dealers named for the local territory by Harry H. Hawke, general salesmanager, follow:

Welling Motor Car Co., Century Auto Co., Southern Motor Co., Brandle Motors Co., Baden Garage, Reidinger Motor Co., Wiemeyer Motor Co., Kuhlman Motor Sales Co. and Byerly Motor Co., East St. Louis.

Hawke said that the next city where such a plan will be followed is Chicago, where a centrally located service station will be purchased or leased and dealers appointed.

The convention of traffic dealers will be held in St. Louis, Dec. 11 and 12.

### U. OF M. ROAD COURSES

Ann Arbor, Mich., Nov. 29—The department of civil engineering, University of Michigan, has arranged short period graduate courses in highway engineering to be given during the winter.

The schedule follows:

Highway Transport. Professor Blanchard. Feb. 2 to Feb. 6, Mondays to Fridays, 1:30 to 4:30 P. M. 1 hour credit.

Bituminous Surfaces and Bituminous Pavements. Professor Blanchard. Dec. 1 to 19, Mondays to Fridays, 1:30 to 4:30 P. M. 3 hours credit.

Highway Laboratory Research. Professor Bateman. Jan. 5 to 23, Mondays to Fridays, 10 A. M. to 12 M., and 1:00 to 5:00 P. M. 2 to 3 hours credit, dependent upon a student's previous training in highway laboratory methods.

Highway Bridges. Professor Gram. Feb. 9 to 20, Mondays to Fridays, 1:30 to 4:30 P. M. 2 hours credit.

Specifications and Contracts. Professor Riggs. Feb. 9 to 20, Mondays to Fridays, 1:30 to 4:30 P. M. 2 hours credit.

Earth, Gravel and Broken Stone Roads. Professor Bateman. March 1 to 12, Mondays to Fridays, 1:30 to 4:30 P. M. 2 hours credit.

Cement-Concrete Pavements. Professor Blanchard. March 1 to 9, Mondays to Fridays, 1:30 to 4:00 P. M. 1 hour credit.

Brick Pavements. Professor Blanchard. March 11 to 19, Mondays to Fridays, 1:30 to 4:00 P. M. 1 hour credit.

Highway Engineering Seminar. Professor Blanchard. Dec. 1 to March 19. 3 hours credit.

The fees for courses are based on the number of credit hours for each course. The fee for each credit hour is five dollars.

## Men Of the Industry

### *Changes in Personnel and Position*

**C. W. Inches** has resigned his position as purchasing agent of Trego Motors Corp., New Haven, Conn., to accept appointment as purchasing agent of Northway Motor Corp., Natick, Mass. Inches was formerly associated with the automotive industry in the Middle West.

**Russell W. Stovel** has been appointed a consulting engineer with Westinghouse, Church, Kerr & Co., Inc. Until recently he was a lieutenant-colonel in the United States engineering corps. He will devote his entire time to electrical and mechanical features.

**C. M. Wallace,** formerly connected with the purchasing department, body division of the Packard Motor Car Co., has joined the Standard Motor Truck Co., as purchasing agent.

**Major W. H. Ewen,** formerly of the British Air Service at headquarters in London, is in America on a business trip. He is now connected with William Cole & Sons, coach builders and manufacturers. Major Ewen was an air pilot and was one of the first to take up flying in England.

**F. W. Sinram,** president of the American Gear Manufacturers Association, has been elected president of the Van Dorn & Dutton Co., gear specialists of Cleveland. Franklin Schneider was elected vice-president.

**A. H. Wisner** has been appointed salesmanager for the Master Six Metz, automobile department of Leslie F. Smith, Inc., wholesale distributors in New York of Master Six Metz and Douglas Trucks. Wisner was formerly commercial car manager of the Colt Stratton Co., and branch manager of the Willys Overland.

**Allan A. Ryan** has resigned as vice-president of the Stromberg Carburetor Co. of America, and has been elected chairman of the board. J. R. Coffin has been elected a director of the corporation to fill the vacancy created by the resignation of H. C. Stutz, and Coffin has also been elected vice-president to fill Ryan's place.

**F. L. Jandron** has been elected treasurer, and F. R. Robinson, secretary of the Packard Motor Car Co., the latter succeeding the late P. H. McMillan.

**L. E. Bixler,** purchasing agent for the United States Metal Goods Co., manufacturers of automobile parts and replacement parts for Ford cars, also formerly purchasing agent for Service Motor Supply Co., has resigned his position to take one with Packers' Machinery & Equipment Co., of Chicago.

**W. W. Vesy,** western salesmanager of Bossert Corp., Utica, N. Y., has been placed in charge of the company's new branch office at 611 Citizens Building, Cleveland. The Detroit office at 1513 Ford Building is now in charge of R. I. Miner, formerly assistant chief engineer.

**George E. Twitmyer** has resigned from the Peerless Motor Car Co. organization to become general salesmanager of Stevens-Duryea. He will be established in his new position Dec. 1.

**Frederick H. Korff** has assumed his duties as factory manager of the plant for the manufacture of gages purchased by the C. E. Johansson, Inc., at Poughkeepsie, N. Y. Korff, who is a Pratt Institute and Columbia University man, is well known in the mechanical field as a consulting engineer. He was assistant factory manager in the several plants of the Wright-Martin Aircraft Corp., makers of the Hispano-Suiza airplane engine.

**John F. Barker,** former president of the Gilbert & Barker Manufacturing Co., Springfield, Mass., died Nov. 21 of heart disease. Mr. Baker came to Springfield in 1862 and was employed at the Water shops of the United States Armory until 1865 when the Gilbert & Barker company was formed. He was treasurer and manager of the company until 1884 when he was elected president. He remained in this capacity until his retirement in 1911. He held the affection and esteem of his associates and employees throughout the long years of active service.

**G. W. Blackiston** has been appointed advertising manager of the American Crayon Co., Sandusky, O.

### JITNEYS TO BE BONDED

HARTFORD, CONN., Nov. 29—Under the new state law jitney owners must be bonded for $5,000 by Jan. 1. At the beginning of the new year a jitney license will cost the owner $25 and in addition to this from $181 to $250 will have to be paid for the bond.

Jitneys are on the increase, the company which controls the trolley situation in Connecticut for the most part having increased its fares by a new zone system. In Hartford alone many regulation passenger carrying buses have appeared. Trips are made to towns 10 to 15 miles from the city at less rates than are charged by the trolleys.

### FORM EXTINGUISHER CO.

NEW YORK, Nov. 29—Formation of the Boyce-Veeder Corp., to manufacture and market an automatic, hand-operated fire extinguisher, is announced by Harrison H. Boyce of the Moto-Meter Co., Inc. Factory and office of the new corporation will be in Long Island City, N. Y. The extinguisher made under the Erwin patents will be on the market Jan. 1. Associated with Boyce in the company is Paul L. Veeder, an attorney of New York and Chicago.

## Goodyear Sales Total $168,914,000

AKRON, O., Dec. 1—Goodyear Tire & Rubber Co. reports sales for the year ending Oct. 31, 1919, as totalling $168,914,000, as compared with $131,247,382 in the preceding year and net profits subject to Federal taxes of $23,277,000 against $15,388,000.

President A. F. Seiberling has set a mark of $250,000,000 as the goal for company's sales in the coming year, stating that production at the present time is just about double what it was a year ago.

### BUY BIG DETROIT SITE

DETROIT, Nov. 29—American Auto Parts Co., capitalized at $5,000,000, has purchased 30 acres of ground for the erection of an automobile spring factory, that is expected to rank as one of the big Detroit industries. The corporation, headed by William E. Perrine, will have a plant of six units to start with and work on the construction of the buildings will be begun immediately. W. P. Culver, manager of sales for the Perfection Spring Co., at Cleveland, will be vice-president and salesmanager of the new concern and J. W. Stannard is secretary-treasurer.

### WILL ADD 4,000 WORKERS

BRISTOL, CONN., Nov. 28—Work is reported to be progressing rapidly on the New Departure Manufacturing Co., expansions in Bristol, Hartford and Meriden.

When completed the plant additions will provide employment for at least 4,000 more workers, and will give the company more than 14 additional acres of floor space.

One of the largest additions will be the general forge plant for the Bristol unit, the main building of which consists of a high one story building 405 x 126.

### REORGANIZE CLARK CO.

OSHKOSH, WIS., Nov. 27—The J. L. Clark Mfg. Co., Oshkosh, Wis., formerly a widely known maker of fine carriages and vehicles, has completed its reorganization as a manufacturer of motor car bodies, motor truck cabs, etc. The capital stock has been increased from $150,000 to $200,000. The new officers of the corporation are: President, H. M. Clark; vice-president, E. M. Clark; secretary and treasurer, W. E. Muir.

### CASE GIVES COURSE

SYRACUSE, N. Y., Nov. 29—The J. I. Case Threshing Machine Co., will hold free service schools at branch houses in the east in December. Students will be taught the operation and care of Case Kerosene tractors, Grand Detour plows, disk harrows, threshers, balers, silo fillers and other tractor operated machines. Service operations will be discussed and illustrated by charts, black-board work and lantern slides.

Dates of the course are at Syracuse branch, Dec. 2 to 5; Harrisburg, Pa., Dec. 16 to 19; Rochester, N. Y., Dec. 9 to 12; Baltimore, Dec. 22 to 24.

## Current News Of Factories

*Notes of New Plants—Old Ones Enlarged*

### BUFFALO PLANT OPENS

BUFFALO, Dec. 1—The new factory branch of the Martin-Parry Corp., Indianapolis, builders of automobile commercial bodies, is now in operation here. The building occupies 35,000 sq. ft. at Chicago and Scott streets. The purpose of the company locating in Buffalo was announced to give truck owners a new and universal service in commercial body distribution.

### PLAN CHICAGO ADDITION

NEW YORK, Dec. 1—To meet production demands, the Doehler Die Casting Co. will add a Chicago factory to its present plants in Brooklyn and Toledo. A seven acre tract has been purchased on which a one story concrete structure will be erected for the manufacture of die castings and bearings. If present plans are fulfilled operations will be started in the new plant about Jan. 1.

### OPEN FLORIDA BRANCH

JACKSONVILLE, FLA., Dec. 1—The Oshkosh Motor Truck Mfg. Co. has opened a factory branch at Jacksonville in charge of Wakeman Hackett, in order to facilitate the delivery of trucks and replacement parts to their users in the southeastern states. The sale of Oshkosh 4-Wheel-Drive trucks in Florida territory has been particularly active since the adoption of that truck by the Florida Citrus Association.

### BATTERY CO. BUILDS

GARY, IND., Nov. 29—The O. K. Giant Battery Co., which is just completing the first unit of its plant, has awarded a contract for the erection of a second building. The new building will be 100x200 ft. The company will manufacture dry batteries.

### MEXICAN CONFERENCE

NEW YORK, Nov. 28—Manufacturers and exporters interested in trade with Mexico have been invited to a conference to be held in Mexico City, Feb. 11-13, according to a letter received from the foreign trade bureau, American Chamber of Commerce of Mexico.

The conference is called to discuss trade problems between the two countries in order that the United States may hold its present trade in Mexico. The proceedings of the conference will be in English, but the report will be printed in English and Spanish.

This will be the first trade conference ever held in Mexico.

### JORGENSON CO. EXPANDS

WAUPACA, WIS., Dec. 1—The Jorgenson Mfg. Co., Waupaca, Wis., a large maker of primers and other metal specialties for gas engines and motor vehicles, has increased its capital stock from $70,000 to $350,000 to accommodate the rapid growth of its business. Part of the new issue will be used to erect factory extensions and purchase equipment. Its trade in a little more than two years has grown to embrace a heavy foreign demand. Officers elected at the annual meeting are: President, P. J. Jorgenson; vice-president, Irving P. Lord; secretary and treasurer, C. H. Jorgenson; assistant, J. C. Jorgenson; directors, William F. Timm and J. M. Brown, Appleton, Wis.

### FLINT SHOW, DEC. 3RD

FLINT, MICH., Nov. 29—The Flint Automobile Dealers' Association will stage its first annual closed car show beginning Wednesday, Dec. 3, and continuing through Saturday. Dallas W. Marshall, president of the association, is general chairman of the committee planning the show.

### CLYDE NOW CLYDESDALE

CLYDE, O., Nov. 29—Clyde Cars Co. has found it necessary to change the corporate name to The Clydesdale Motor Truck Co. Intensive sales and advertising campaigns caused the name Clydesdale to become so familiar with patrons, the company name was lost sight of and a great majority of mail and telegrams within the last two years have been addressed to the Clydesdale Co., causing endless confusion, and necessitating action in court to have the name changed to meet the customers' wishes.

### FOREIGN OPPORTUNITIES

WASHINGTON, Nov. 30—The Bureau of Foreign and Domestic Commerce, Department of Commerce, has received requests for automobiles or parts agencies of business from individuals and companies in foreign countries. These are listed below.

For further information address the Bureau of Foreign and Domestic Commerce and specify the Foreign Trade Opportunity number.

An agency is desired by a man in Egypt for the sale of light low-priced motor cars. Quotations should be given c. i. f. Alexandria. Payment, cash on arrival. References.

A firm in Argentina desires to secure an agency for the sale of accessories for low-priced automobiles. 31372.

A company in Greece desires to purchase and secure an agency for the sale of motor trucks. References. 31378.

### SELLS SIMPLICITY WHEELS

**Columbus, O., Nov. 27—The Simplicity Wheel Co. has been incorporated with a capital of $15,000 to act as agent for the Simplicity wheels for Ford cars, in the territory surrounding Columbus. Robert C. Byers is president.**

# Calendar

### SHOWS

January—New York. International Automobile Mfrs.' Congress.

Jan. 3-10—New York, N. Y. Grand Central Palace, National Automobile Chamber of Commerce. S. A. Miles, Manager.

Jan. 3-10—New York City. Eighth Coast Artillery Armory, commercial cars and accessories.

Jan. 3—Chicago. Airplanes. Manufacturers' Aircraft Association. Congress Hotel.

Jan. 17-31—Cleveland. Nineteenth Annual Automobile Show, Cleveland Automobile Mfrs.' and Dealers' Assn., Wigmore Coliseum.

Jan. 17-24—Hartford, Conn., Shows, State Armory. Manager Annual Exhibition. Arthur Fifoot.

Jan. 19-25—Milwaukee, Wis., Auditorium, Annual Motor Exhibition. Milwaukee Automobile Dealers' Inc.

Jan. 24-31—Chicago, Ill. Coliseum. Cars: Drexel Pavilion. National Automobile Chamber of Commerce. S. A. Miles, Manager.

Jan. 24-31—Chicago. International Amphitheater, commercial cars and accessories.

Jan. 31-Feb. 6 — Kansas City, Mo. Annual exhibition, Overland Bldg. E. E. Peake, Manager.

Feb. 2-7—Toledo, Ohio. Annual Automobile Show, Terminal Auditorium.

Feb. 9-14—Nashville, Tenn. Nashville Automobile Trade Association.

Feb. 21-28—Ottawa, Ont. Motor Show.

Feb. 23-28—Louisville, Ky. Twelfth annual exhibition, Louisville Automobile Dealers' Assn., First Regiment Armory.

February—Chicago. International Automobile Mfrs" Congress.

February—Deadwood, S. D. Annual Show, Deadwood Business Club. F. R. Baldwin, Manager.

March 13-20—Boston, Mass. Annual Automobile Show. Mechanics' Building.

### FOREIGN SHOWS

December—Brussels, International Automobile Mfrs.' Congress.

January—Glasgow, Scotland Scottish Motor Exhibition.

February — Manchester, England. North of England Motor Exhibition.

Feb. 22-March 6 — Birmingham, Eng. British Industries Fair.

March—London, Eng. Motor Boat Marine and Stationary Engine Exhibition.

March—Adelaide, Australia. All Australian Exhibition of motor vehicles, airplanes, engines and automotive equipment.

March 1-15—Lyons, France. Automotive Producta. Lyons Industrial Fair.

April or May—London, Eng. Commercial Vehicles Exhibition, Olympia.

April 3-May 4—Buenos Aires. Exposition of U. S. manufactures.

### TRACTOR SHOWS

Feb. 9-14—Wichita, Kan. Tractor and Farm Machinery, Forum, Wichita Thresher-Tractor Club.

Feb. 16-21—Kansas City, Mo. Fifth Annual Kansas City Tractor Club. Guy H. Hall, Manager.

### CONTESTS

June, 1920—Omaha, Nebr. Reliability Truck Tour.

August, 1920 — Paris, France. Grand Prix Race, Sporting Commission. Automobile Club of France.

### CONVENTIONS

Dec. 3-5—Cleveland, Ohio Automobile Trade Assn. annual convention.
American conference.

Feb. 9-13—Louisville, Ky. Seventeenth Annual Convention American Road Builders' Assn., Tenth American Good Roads Congress and Eleventh National Good Roads Show.

May 15-20, 1920—San Francisco. Seventh National Foreign Trade Convention.

## Sampson Tractor Co. Buys Machine Plant

JANESVILLE, WIS., Dec. 1—The Samson Tractor Co., Janesville, Wis., is converting the former plant of the Janesville Machine Co. for the production of the Samson 9-passenger car and the Samson farm truck, production of which will begin late in December on a quantity basis. The Samson company purchased the Janesville Machine Co. when it decided to locate its great tractor plant in that city. Recently the implement and power farm machinery works were consolidated with the new Samson factory. The buildings thus released will be used for the manufacture of the passenger and commercial car, at least until new units have been added to the Samson plant to accommodate this operation.

## Carriage Company to Make Car Bodies

COLUMBUS, O., Dec. 1—A contract has been awarded by the John Immel & Sons Co. for the erection of a $400,000 plant on South Front Street, Columbus, for the manufacture of automobile bodies. The work of erecting the plant will start at once and it is expected to have it completed early in the spring. This concern has been in existence for 60 years and has a wide reputation for wagon and carriage building.

At present the company has orders for approximately $3,500,000 worth of work, mostly passenger bodies. An order for 1,250 bodies from the Allen Motor Car Co., of Columbus, was booked recently. The principal building in the new plant will be 250 x 350 ft., of modern saw tooth construction. In addition there will be a power plant, drying kilns, enameling plant and other departments.

## Penna. Co. Builds Homes for Workers

JEANNETTE, Dec. 5—The Pennsylvania Rubber Co., makers of Vacuum Cup tires, have purchased 200 acres of land to the south of Jeannette, where its factories are located, upon which they will develop a model town so its workers may acquire their own homes.

The original building contract called for twelve houses, but these were so eagerly sought, the company determined to extend its contract to the building of fifty more, with an ultimate goal of 1,600 houses. The second allotment of fifty is well under way, ten will be ready for occupancy by Dec. 15, and the entire lot by April 15, 1920.

Selling plans include a nominal initial payment, and monthly payments spread over a number of years. Restrictions are imposed to make it a high class home community. While planned to take care of the steadily increasing number of Pennsylvania employees, no non-employee of good reputation will be excluded.

## Seaman Body Corp. Begins New Plant

MILWAUKEE, Dec. 1—The Seaman Body Corp., Milwaukee, a recent reorganization of the W. S. Seaman Co., 480 Virginia street, has broken ground for a complete new manufacturing plant costing about $1,500,000, to be equipped for making open and closed bodies for the higher priced passenger car builders. The new factory will be 420 x 720 ft., four stories high. The first unit, now under construction, is 180 x 420 ft.

### AUTO TRUCK CO. GROWS

MILWAUKEE, Dec. 1 — The Auto Truck Service Co., 946 Third street, Milwaukee, has increased its capital stock to $50,000 and will start work soon upon a new factory, equipped for making mechanical hoisting devices and appliances for motor trucks with dump bodies. The officers are: President, Theodore Hollnagel; vice-president, Frank Gerlach; secretary-treasurer, George Stein.

### TO BUILD IN CANADA

AKRON, O., Nov. 29—Firestone Tire & Rubber Co. will build a $5,000,000 plant at Hamilton, Ont., which will employ 2,000 persons and have a daily capacity of 3,500 tires. Work on the construction of buildings for the factory will begin in the spring.